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Studies in Physical Exertion: II. Individual and Group Reaction Time in Football Charging[1]

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Introduction

SPEED is not everything, but it is a big fundamental factor in most athletic contests and especially in those which involve playing with a ball. Coaches and trainers regard successful competition as evidence of speed and doubtless this is usually a valid assumption. On the other hand, most any athlete is likely to think of himself as quick or at least capable of being quick. If others beat him, he can easily find reasons for this that are not derogatory to his own abiding sense of capacity. The results of any race or game leave him unconvinced. He says to himself, "I will come out ahead next time." All power to him! It is lucky for humanity that such a spirit springs eternal. How dreary it would be if each individual were born with a rating index branded in his right palm and the name of his life work stamped in the left. Even the football coach, desirous as he is of having a perfectly organized, efficient team, would hardly like to have all his men presented to him thus marked. But there is a legitimate, important place for scales, tape-measure, stop-watch, and similar instruments of measurement. And these things can be used to general advantage without undue trespass on the domain of individuality and personal effort. We delude ourselves if we imagine that the coach, unaided by instruments, can arrive at perfectly objective and non-partisan selections. Human judgment shows a strong tendency to accentuate minor items and these may or may not be generally representative of a given man's quality or performance. Instrumental measurement is likely to be less biased but obviously even these results should not be followed blindly.

In a former article I have described a time measuring instrument, suitable for use with groups of individuals in the gymnasium

[1] Made possible by the Thomas Welton Stanford Fund for Psychological Research. This investigation is a part of a larger program of studying the response speed of individuals and groups of individuals in connection with athletic performances. The article describing the apparatus which I have used appeared in the "American Physical Education Review" of June, 1928. (Vol. XXXIII, No. 6).

or on the athletic field.[2] The reaction time, or promptness of action of seven individuals can be measured all at once. The time is recorded on a large paper-covered drum which makes one revolution per second. Each athlete in reacting springs a latch which permits a golf ball to strike on the drum and record his reaction time. The full details concerning this rugged, simple device are given in the former article, but a general view of the apparatus is presented herewith in Figure 1, and as used with squads of football men in Figure 2. It is the object of the present paper to report and discuss reaction time results which have been secured on a good-sized group of football players at Stanford University.[3]

Procedure

The multiple chronoscope was placed at one side of the practice field near an outlet of the regular 60 cycle lighting current, and convenient to the players so that squads of men could be detailed for "work on the charging machine" without loss of time. The men came in the squads in which they had chiefly been practicing. First the entire line was taken for measurement. Later the "backs" of the different squads were formed into lots of seven and measured. An assistant coach brought the men to the apparatus, lined them up in front of the charging frame with its seven triggers, instructed the players to take their regular stance, and cautioned them about getting offside. The coach checked on this latter point as the test proceeded.

The men were started by the writer. They stood in suitable depressions for their cleated football shoes and when all was ready and the chronograph drum in motion, each man took his regular stance with the top of his head against the vertical trigger in front of him. Then the starter called: "Position—signal—hike." The pause between the last two words was variable from one to three seconds. The men were to charge on the word "hike" and *not before actually hearing it.*[4] The eighth latch (holding the signal ball) was sprung at the same moment the word "hike" was called. In charging, the players rushed forward ten to twenty feet. Immediately after the charge the drum was stopped and a pencil line was drawn at the position of the signal mark. This line was made parallel to the axis of the drum and formed the signal line for that one charge. Then the drum was turned and all the seven record spots were identified and marked with the number of the charge and the name of the player. The latches were then reset and loaded ready for the next trial, which was recorded on the same paper. When the men took their places again

[2] Miles, Studies of Physical Exertion: I. A Multiple Chronoscope for Measuring Groups of Men. Am. Physical Edu. Rev., 1928, XXXIII, 379-387. The reader will please note that in the original article Figure 2, which shows the battery of eight latches, was printed upside down.

[3] In the carrying out of the tests here reported I was assisted by Mr. Kirk Miles.

[4] The charge was carried out as nearly as possible according to usual football practice. See Glenn S. Warner, "Football for Coaches and Players," Stanford University Press, 1927.

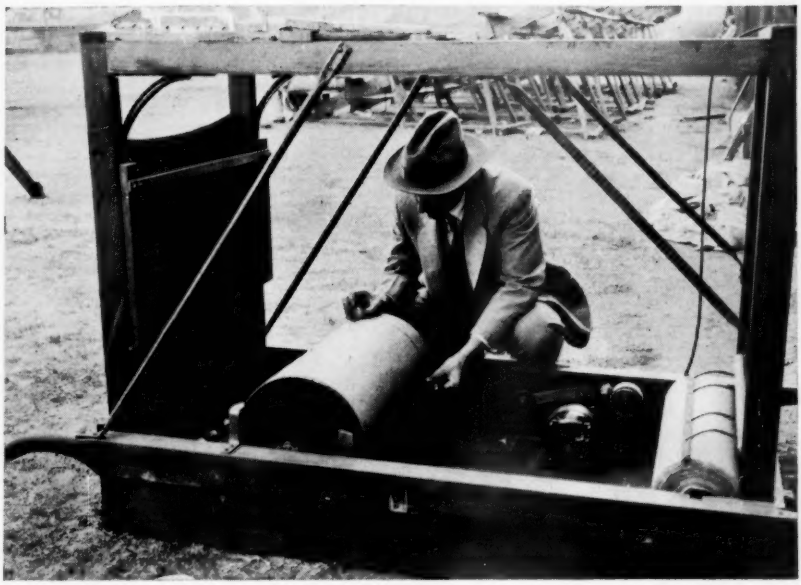

FIGURE 1.

The multiple chronoscope for use in the gymnasium or on the athletic field.

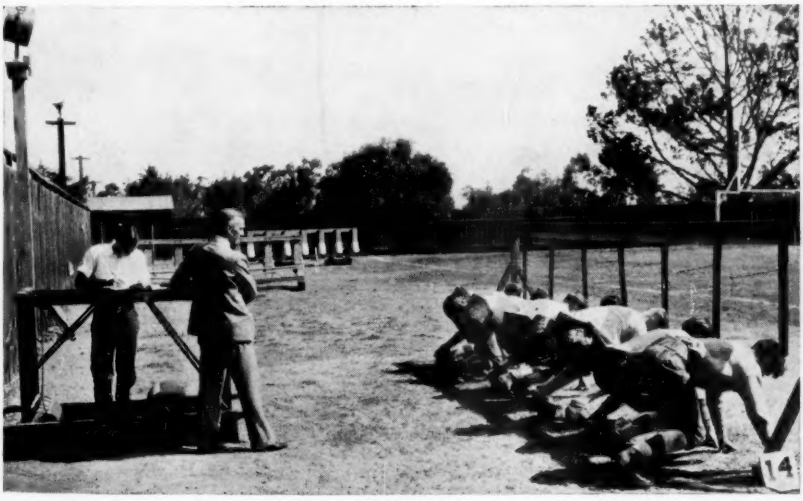

FIGURE 2.

A line of seven football players in the process of having their charging times measured. They are waiting for the signal word, "hike."

they shifted one position, number one taking trigger two, etc., and number seven taking trigger one. These shifts were made systematically so that in the seven charges which constituted the test each man should have one trial on each of the seven triggers. This rotation gave equal chances to all the players and operated to impress the men with the fairness of the test. The making of the seven charges and the marking of the records together with preliminary instructions required fifteen to twenty minutes.

After each charge the squad would gather about the drum to note the results. Individual reaction times were not measured up but the relative positions of the seven record marks, i. e., who had gotten away the quickest, who had been slowest, and so on, were perfectly clear to be seen. This immediate visibility of objective results motivated intense competition. Many questions were asked about how much weight the coaches were going to give the results, etc. The players took the measurement seriously and apparently considered it indicative of ability.

The seven charges were recorded on one "drum-cover." There were thus seven numbered signal lines and seven sets of numbered initial reactions. The measured distance from the center of a reaction spot to its signal line in millimeters equalled the time in .001 sec. An average was made for the seven charges by each man and the mean variation of the seven trials about this average was determined. When players were measured on a second occasion to note their degree of self-consistency and the practice effect, this second measurement was taken after two or more days had elapsed, usually a week later.

Results of Tests

In the ordinary determination of simple reaction time in the psychological laboratory one finger is pressed lightly on a telegraph key. After a short interval a pre-arranged signal is given, and the subject lifts his finger from the key as quickly as possible after he perceives this signal. The mass to be moved and the movement to be made are both slight. The subject's general posture is favorable for detecting the signal and for starting the action. The action itself is one in which the individual has good facility and in addition the subject is usually tried many times and so improves from practice. Under these conditions normal adults have been found to average from 120 to 170 s^5 when a sharp auditory signal was used. Reaction time differs for different types of signals; for example, the ear is quicker than the eye, and of course it is easier to respond to a fairly loud signal than to a faint one.

If unpracticed adults are measured and if the response requires the movement of one hand and arm, the time required for auditory

[5] Thousandths of a second.

signals of moderate intensity may be about 180 to 250 s. A few trials of this sort were made with the multiple chronoscope. Six men served as subjects. Strings were attached to the latches and the men stood with their backs to the apparatus and with the taut strings over their right shoulders. On hearing the click of the signal latch each man was to jerk his string. The group averaged 238 s. The individual averages ranged from 203 to 272 s.

In charging from the football stance, the entire mass of the body has to be moved and the position is probably not the most satisfactory one for quick response. It has been adopted in favor of forceful action, rather than for speed. The stance position requires so much tension on the great muscles that the body can not place itself with nicety against a lightly adjusted reaction key. For this reason it was necessary to have each trigger on our charging frame so adjusted that the free end would have to be pushed about four inches before the connecting piano wire would trip the latch. This four inches, which of course added considerably to the recorded time, allowed amply for the inequalities in the positions of the different men and for the same man on successive trials. The instructions were: "Touch the trigger with your head, but don't push on it until after you hear the signal." Pushing had to be by thrusting the whole body forward; in the position taken it could not be done by nodding or otherwise jerking the head.

A total of 87 football players (no Freshmen were included), measured in the way described gave an average charging reaction time of 389 s, m.v. 39 s. This value is unreduced for instrumental latency. The range for the 87 men was from 268 to 523 s, with a median value of 382 s. The quartiles in order gave the following ranges and averages: I, 268-352, mean 325; II, 353-382, mean 364; III, 383-414, mean 401; IV, (21 men) 415-523, mean 448 s. The average mean variation for the entire 87 men was 49 s, which shows that the variation equalled about 13 per cent of the average time. The coefficient of variability was computed for each man and was found to range from 5 to 25 per cent. We therefore conclude that the football charge when it occurs as a response to a signal the exact timing of which cannot be guessed by the players requires about 0.4 sec. as an average.

In the particular season considered the official Stanford Squad listed 55 men. I have records on 53 of these and find that the average of the individual averages is 381 s. The 53 of course included the 11 men who were placed in the "starting line-up" for the big game of that season. These 11 averaged 353 s, i. e., 28 s below their general group average. Nine of them had individual averages that ranged from 298 to 364 s. The other two men in the eleven scored 431 and 434 respectively. The men were chosen for their positions

and for the team without any consideration given to the objective reaction scores made so that the reaction tests are in the present instance merely confirmatory evidence for the ability of the coaches to select the right men.[6] The 23 men on my records who were practicing football plays at the beginning of the season (when the others were measured) and who were dropped or did not appear on the final squad had an average charging time of 392 s. This group included the very slowest men in the entire 87, but it also numbered some of the fast ones. Thus we see that the averages at least fit the groups fairly well, and the difference between the Varsity average and the Squad average is probably significant.

The matter of individuality and self-consistency was studied to some extent. A group of 54 of the football players was measured on two different occasions, separated by two or more days. The average of all results for the first day's measurements was 390 s, m. v. 39 s, and for the second 375 s, m. v. 36 s. This indicates a moderate amount of improvement with practice and is another evidence that practice gain is almost always possible when conditions are standardized and trials are repeated under increased motivation. The two series of 54 reaction scores were correlated by the Pearson method and the coefficient found was $+.36\pm.08$, which shows a reasonable consistency between the two performances of each man. Those who were slow on the first trials tended to be slower than average on the later occasion, and there were others who tended to be faster than the average in both sets of trials, while others shifted somewhat up or down from their first average.

On 53 of the men included in this series trustworthy data were available for weight and height, and accordingly correlations have been made with charging reaction time. The coefficient for weight with reaction time is $+.22\pm.09$, thus giving some evidence (not strong) that the heavier the player the slower he gets into action and succeeds in tripping his latch. This result was probably to be expected. It is noteworthy that the big, heavy fellows get into action as quickly as they do. Height with reaction time gave a correlation coefficient of $+.08\pm.09$, and since this is less than its own probable error, even the direction of the result can scarcely be trusted except that it tends to agree with the result for weight in that the tall men are apt to weigh above average.

There are 53 men on whom I have data who can be quite certainly placed as to team position. It may be worth while to arrange these in position groups and compare the averages. This is done in Table 1. Of course the individual groups are relatively small, but the positions rank in an order that is not illogical. The backs are

[6] One of the coaches later said: "It took me two years to decide on those selections but apparently you got a line on some of the men in about twenty minutes." Of course it is recognized that the coach's appraisal included many other factors besides that of speed.

fastest with an average of 360 s. The ends come next, and the guards, tackles, and center follow in order.

TABLE 1

VARSITY FOOTBALL PLAYERS CONSIDERED ACCORDING TO POSITION AND AVERAGE CHARGING SPEED
(Values in .001 sec.)

No.	Position	Average	M.V.
18	Backs	360	38
9	Ends	377	34
10	Guards	383	42
11	Tackles	395	41
5	Centers	444	30

A complete set of data, including the individual trials for the seven Varsity team linemen, is presented in Table 2. The values given under 1 to 7 from left to right represent the separate trials. The letters A to G represent the individual players. The average for each individual player is given at the right of the 7th trial. It will be noted that six of them are well below 400 s. They show considerable difference among themselves in the amount of variability (column at extreme right). At the bottom of the table the averages are given for the group and it is seen that as a whole they tend to react more quickly in successive trials, which is evidence of improvement from practice within the 15 or 20 minutes of testing.

TABLE 2

SPEED IN FOOTBALL CHARGING FOR SEVEN VARSITY TEAM LINEMEN
(Values in .001 sec.)

Player	Charges							Average	M.V.	Per cent deviation
	1	2	3	4	5	6	7			
A	.312	378	305	314	231	285	388	316	38	12.0
B	.425	367	369	373	399	283	335	364	32	8.8
C	.410	437	275	427	444	327	332	379	58	15.3
D	.485	368	414	329	352	395	392	391	35	8.9
E	.328	298	390	350	294	235	350	321	39	12.2
F	.407	409	368	395	395	346	324	378	27	7.1
G	.405	467	388	370	416	458	335	405	35	8.6
Grand average	.396	389	358	365	362	333	351	365	38	10.4
Deviation	44	42	39	30	59	57	22	42		
Per cent Deviation	11.1	10.8	10.9	8.2	16.3	17.1	6.3	11.5		

The coaches were very cooperative in this investigation and kindly agreed to undertake the making of a composite rating for the squad members. A total of 78 men were rated. The players were first divided into centers, guards, tackles, ends, and backs, and each subgroup was ranked separately on speed and on efficiency in both instances wholly without information on the reaction time scores. The results of this ranking, together with the reaction time scores, are shown in Table 3. For each sub-group the ranking in speed is indi-

cated by the numbers 1, 2, 3, etc., in order under the letter S. The efficiency ranking, under E, is in terms of the speed placement, thus among the centers the man who was thought fastest was considered second in efficiency, and the fourth fastest man was judged first in efficiency. The outstanding result of this comparison is the close agreement within each sub-group between the ranking on speed and the ranking on efficiency. There are a few instances of marked shifts, but as usual in such comparisons these tend to be in the middle of the series. The "centers" are not typical because in the other four groups speed and efficiency show almost identical agreement near the top. All the groups show this agreement at the lower end. It appears certain that the coaches who made these rankings were firm in the conviction that speed is a fundamental condition for efficiency in football players.

TABLE 3

COACHES' RATING OF FOOTBALL MEN FOR SPEED AND EFFICIENCY COMPARED WITH MEASURED REACTION TIME RESULTS

(S, speed ranking; R.T., reaction time measured with the multiple chronoscope in .001 sec., E, efficiency ranking in terms of the speed placement.)[1]

Centers			Guards			Tackles			Ends			Backs		
S.	R.T.	E.	S.	R.T.	E.	S.	R.T.	E.	S.	R.T.	E.	S.	R.T.	E.
1	482	4	1	335	1	1	322	1	1	316	1	1	434	1
2	...	1	2	328	2	2	...	3	2	326	2	2	361	2
3	415	3	3	431	3	3	298	2	3	...	4	3	463	3
4	457	2	4	403	5	4	378	5	4	349	3	4	379	4
5	402	5	5	412	4	5	414	6	5	405	7	5	363	5
6	467	6	6	414	6	6	...	7	6	371	6	6	...	8
			7	422	7	7	391	4	7	356	5	7	326	9
			8	...	8	8	467	9	8	438	8	8	268	11
			9	318	9	9	...	8	9	396	9	9	356	7
			10	405	10	10	369	10	10	317	10	10	365	6
			11	...	11	11	...	11	11	379	11	11	386	14
						12	383	12	12	...	12	12	...	17
						13	376	13	13	441	13	13	352	18
						14	...	14	14	434	14	14	382	19
						15	...	15	15	404	15	15	331	10
						16	...	16	16	321	16	16	351	16
									17	380	17	17	278	13
									18	364	18	18	353	20
									19	408	19	19	401	23
												20	471	21
												21	356	15
												22	376	22
												23	...	12
												24	...	25
												25	432	26
												26	...	24
												27	...	27

[1] The personnel represented in this table does not agree entirely with that which has been grouped in Table 1.

How well were the coaches able to rank the men for speed? This we can not settle at present. It is a matter well deserving of further

study. The reaction time scores have been entered in Table 3 so far as they were available. In each case the score given is the average for the first 7 charges recorded for the man opposite whose speed rating the value is entered. We find that for guards, tackles, and ends the men placed at the top of the speed lists by the coaches actually show reaction time scores which are decidedly among the better scores for their respective groups, that is, the coaches were substantially correct as judged by the data. On the other end they did mark down a good many men who appear to score above the average. The centers were all comparatively slow and as there was little to choose we may forgive the coaches for placing the man with the slowest score first. The backs as a group seem to show the nearest to pure chance matching. The fastest two men in this large group of players were ranked 8 and 17 respectively by the coaches. It may be that back-field play is so varied and individual as to make speed ratings much more difficult than when judging linemen. So far as we may trust the indications of Table 3 it hints that coaches place a high valuation on speed in football and that they are more accurate in their selections for this capacity than in their rejections.

Conclusions

The whole scientific problem of reaction time as a field for careful investigation grew out of observations by astronomers who noted differences among themselves in recording the moment when the image of a star reached the cross hairs of an optical instrument. These differences gave rise to the concept of the "personal equation" that came to be thought of as a determinable and reliable time value which represented the speed factor in a given person's action. Although athletics had been literally playing with these speed factors for centuries out of mind, it generally happened that the associated factors of training, motivation, and effort occupied the conspicuous surface position and got most attention. Native factors that had to do with physical build were early recognized, but that inner organization which makes for speedy action came but slowly to be considered.

Reaction investigations have usually been rather intensive studies on one or a few individuals. It was at first assumed that if a man was quick in one thing, such as moving the hand or finger, this score would be taken as representative of his speed in other motor performances. Now we find from the careful testing of many individuals on a wide variety of measurements that one score must not be trusted for all. If a man is quicker than the average in lifting his finger in response to a pre-arranged signal, he probably will not be the slowest in football charging but he may be slower than the average. Therefore in place of taking one motor test and enlarging on its interpretation it is more informing and useful to arrange new

reaction experiments to closely approximate the particular skill or motor task that we desire to study or train men for.

Some tasks are ordinarily performed by lone individuals but, if our interest happens to be in such a thing as football, we recognize that the group situation is a very important part of the performance. If we wish to know how promptly a particular individual can start his charge after the signal is given, we need to measure him under conditions which resemble as nearly as possible those of actual football play.

I believe that such measurements are desirable not only for scientific information but for practical applications in a great variety of ways. Trainers and coaches clearly see the importance of prompt action in their men. In the past this has been thought of as a matter of training and practice, both of which undoubtedly are very influential. We now see that there is a considerable native factor which it is better to work with than to blunder around. New instrumental aids will make it increasingly possible for the good coach to so select his "timber" that the resulting athlete will be competing in those games or events for which he has good natural and trained capacity. The multiple chronoscope which has been used in this investigation is, I hope, a contribution of this sort and the results secured seem to offer attractive practical possibilities. They point to the conclusion that speed is important but that first of all it is wise to discover who has the speed and in what degree.

Studies in Physical Exertion: III. Effect of Signal Variation on Football Charging

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The Problem of Signals

THE successful football team not only demonstrates speed but shows unison of movement. Snappy, precise action in unity is the strength objective toward which the coach works and the men train. The effort is to make the eleven individual nervous systems into one well-integrated, powerful machine. This has to be accomplished in large part on a stimulus-response basis, and involves the use of signals. These give character and sequence to action, and provide a means for timing movement particularly in its initial phases. Therefore we find that starting signals in football are generally regarded as particularly important, and form the basis for much discussion. While coaches vary in their opinions and preferences, they all recognize the desirable ends to be attained by signals properly devised and expertly called. It is worth while to notice some of the statements that have been made on the subject.

The late Knute Rockne observed, "The old-fashioned method of having every man on the offense watching the ball is not effective, as the offensive team charges after the ball has been passed, and they do not get as good a look at their opponents as they might. The advantage of the vocal signal is that it gives the offensive linemen a chance to watch their opponents, and also it gives them a chance to anticipate the passing of the ball, so they can charge with the ball, and not after it has been passed. The best method of putting in a charging signal is to put in a key number."[1] This criticism of the visual signal (watching the ball) seems very much in point, and conforms absolutely to the large amount of reaction time data that has been accumulated in psychological laboratories, where it has characteristically been found that the shortest reaction time occurs for auditory signals. Response to visual signals is often about .04 sec. slower.

The difficulty of securing the unison start is emphasized by Warner, in his comments as follows: "Whatever system of starting signal

[1] K. Rockne, Coaching. New York, The Devin-Adair Co., 1925, 168-169.

is used, it should be such that the players get off together, and my experience has been that they get off less raggedly, to a more unified start when they cannot anticipate when the word or starting number is going to be shouted. If they can anticipate it some of the players are inclined to beat the starting signal and the timing of the plays is all disarranged. If either the second or the third number is the starting signal and the man giving the signal rushes the numbers, calling them rapidly, some of the men will start the instant he begins calling numbers. The starting series should be given with a pause between each number, and single digit numbers should be used. There should be fully a second's pause between each number."[3] On the other hand, Cavanaugh holds that the football charge should be started on an anticipatory signal. He thinks it best that the quarterback should call all his numbers in rhythmic staccato, and that every player should know how many numbers he will have to wait. Then the player makes his charge with, and not after, the utterance of the starting number. "The charge, the snap, and the quarterback's bark all going together."[4] Jones has practically the same advice. He says, "The starting signal if loosely applied is detrimental rather than beneficial to good offensive starting. A key number should be used and it is best to use the second number after the key number for the start because it allows the player a little more time to adjust himself. The starting series of numbers should be given not only distinctly but in rhythm to get the best results. Non-uniformity in calling the starting series develops a tendency in the players to hesitate."[5]

The disadvantages of a position signal seem very real to Wilce. He states, "The starting signal which starts us only when we hear a certain definite number is the fairest . . . . In starting signals where a team starts on the fifth number, there is usually some player who thinks to himself: " 'Well, I'm a little tired, and I'll just start a little before that fifth number, and it will appear that I am getting a faster charge than my fellows.' The definite number system protects the team against itself."[6]

These statements of opinion, not altogether in agreement, bring out the following points which seem important in reference to the arranging and giving of starting signals for the purpose of initiating the football charge.

1. Rhythm, that is, evenness in calling the numbers, is considered a basic method for obtaining unity of charge in groups of men; whereas non-rhythm, which is more frequently the characteristic method for starting sprinters, accentuates individual difference in reaction speed.

[3] G. S. Warner, Football for coaches and players. The Stanford University Press, 1927, 122-123.
[4] F. W. Cavanaugh, Inside Football. Boston, Small, Maynard & Co., 1919, 189.
[5] H. H. Jones, How to Coach and Play Football. Iowa City, Iowa, Clio Press, 1923, 105.
[6] J. W. Wilce, Football: How to Play It and How to Understand It. New York, Scribner's Sons, 1923, 204-205.

2. A great many trainers appear to work on the principle that the men should be able to anticipate the charging signal and thus charge as and when it is called. The place and location of the signal is here known beforehand, e.g., the fourth number called.

3. Many coaches hold that the best type of signal is the non-anticipatory which is responded to as quickly as possible wherever or whenever it happens to occur in a series of numbers that is called. Here the number to be responded to is known but not its position in the series.

4. A preliminary or "set" signal is advised by some coaches.

5. Starting signals may be given as series of single or double digits. It is plain that the single digit numbers are more easily heard. Some coaches urge that double digits promote attention by the fact that they tend to be called more rapidly. This feature of signal systems therefore appears to be largely a matter of rate of calling the numbers.

6. In most systems the play number and the charging number are two distinct signals. When the huddle method is used the play number, or both play number and starting number, may be obtained in the huddle.

7. Signals may be called in single or double series and they may or may not be grouped.

From the foregoing it is obvious that there are a great many possible variations in the starting signals used for initiating football charges. In the present study we have narrowed our problem to the following considerations: (1) the effect upon speed, uniformity and offsides from calling signals at various rhythm rates; (2) comparison of the effects of anticipatory and non-anticipatory signals; and (3) the effect of non-rhythm upon speed, uniformity and offsides compared against signals given in rhythm.

Apparatus and Procedure

The apparatus which we have used for recording player's charging time has been fully described in former papers.[6] This timing mechanism is a rugged device which can be used in the gymnasium or on the football field and seldom needs any kind of repair. It has been so arranged as to conform very closely to the actual conditions of football play so that there is very little by way of special instruction needed for adapting the men to the tests.

In the present experiment much use was made of the voice key. (See diagram G in the original paper I.) The vocal signals were called in front of this key and it was managed in such a way that when the starting number was called the voice key closed a circuit actuating an electro-magnet which tripped the signal latch and per-

[6] W. R. Miles. Studies in Physical Exertion: I. A multiple chronograph for measuring groups of men. Am. Physical Edu. Rev. 1928, 33, 379-387; and II, Individual and group reaction time in football charging, Research Quarterly, October, 1931, pp. 5-14.

mitted a golf ball to strike and record on the revolving drum. The person calling signals could thus devote his entire attention to making the signals rhythmic and in even cadence. He did not have to perform a hand movement to spring the latch at the some instant he gave the vocal signal. This automatic feature was very useful.

For purposes of comparing the different signal variations it was desirable to use the same subjects throughout the entire series, and it was more necessary to use dependable men than to work with a large group. Four men were selected and served throughout the measurements. All of these had played football for two or more years, were at the time in practice, and in good physical condition. The adequacy of their preliminary practice was shown by the fact that throughout the period of measurements they demonstrated only a very slight amount of learning as shown by quicker charges.

Four rates of calling rhythmic signals were adopted. These were 40, 60, 100, and 120 single digit numbers per minute, thus involving interval periods between digits of 1.5, 1.0, 0.6, 0.5 seconds, respectively. The experimenter used a stopwatch and a metronome to control himself in calling these rates. When calling signals the pendulum movement of the arm of the metronome was observable to him. The signals were all called throughout this investigation by the same individual (Graves), who was responsible for carrying through the tests. He had had much experience as a quarterback, and later as coach, and called the signals according to regular football field style.

Single digit numbers were used, and always a preliminary signal was given. An example for starting the men in a charge would be as follows: On calling the word "Signals," the men were set, after which a series of seven digits such as 3-5-9-7-2-4-1 was given. The order of the signals was of course varied for each separate charge, but in all cases there were seven single digit numbers called. All peculiar arrangements of the signal numbers preceding the starting number were avoided. Great care was used not to emphasize certain numbers preceding the starting number, and to avoid stressing the number immediately preceding it. As a rule, one or two numbers were called after the starting number had been given. The starting signal was never called in first or second place, but might be in any of the other five places. It was found that the digit 2 was the best number to call in the voice key, and this digit was used as the signal in both anticipatory and non-anticipatory series. The objection against adopting one particular digit for the starting signal in all cases might be that in an anticipatory series if a man through inattention failed to remember the position number he could respond about 0.3 seconds after the digit 2 had been called; whereas if 2 had not been used regularly he would, it might be supposed, fail entirely to respond. However, we know this would not be the case, since the

charge of the other men also constitutes something in the way of a stimulus, and serves to take the inattentive man into action even though he has not heard the signal himself.

For each part of the experiment a number of practice trials, with results unrecorded, were arranged to precede, so that the routine would be in good running order before actual measurements were taken down. The separate parts of the experiment were distributed throughout the period of days on which measurements were taken, so that no one part was fully tested out in a single day's work. The experiments continued over a period of four weeks, and were conducted on Monday, Wednesday, Thursday, and Friday afternoons from 4:00 to 4:45 o'clock. The entire series constituted a total of 1440 charges for the four men. About 35 charges were made by each man at each test period. The actual time to complete a charge required from 2 to 15 sec., and there was an interval of approximately 2 min. between each separate charge. The work was hardly strenuous enough to cause much fatigue. Every effort was made to have the experiments arranged in close agreement with actual playing conditions. The men placed themselves before the charging boards or triggers in the football stance, charging in the same manner as they would in actual practice play. Other athletic activities going on around the men who were being measured constituted the typical distractions usual on the football field. The men had to charge a distance of about six inches before the triggers would trip the latches and record, but the charge was to be continued for a distance of 3 to 5 feet. Thus the recorded response was a matter of moving the entire body of the player a distance sufficient to be noted by an official. Small differences in stance and slight movements of the body did not serve to trip the triggers.

Results of Anticipatory Signals

The first problem to be considered is the influence of the rate of calling signals. As stated above, four representative rates, 40, 60, 100, and 120, single digit numbers per minute were tried. In this anticipatory series the actual starting number, or "beat" was located at each of the five possible places an equal number of times. The charging was never called for on the first or second number given, because at least two counts are necessary for subjectively establishing a tempo to serve as a basis for anticipating the position of the signal count.

Three features of these results interest us: first, the rate at which the men get started; second, the number of off-sides; and, third, the uniformity of action in the group. These phases of the results are covered in Tables 1, 2, and 3, respectively. In determining the speed and uniformity of charge, all the charges at each rate of calling signals were taken into account. Even off-sides, and somewhat irregular charges were not discarded when figuring up the average starting

speed. In Table 1, which shows the effect on the speed of charge from calling anticipatory signals at different rates, the four rates used are indicated at the extreme left. The central portion gives the average speed for the group of four men starting on signals that came at positions 3 to 7 in the seven digit series. For example, at the rate of 40 per min., charging on the third number in the series called gave an average for the four men of 210^s (thousandths of a second after the signal had actually been called). The theory of the anticipatory signal (see the terse statement of Cavanaugh above) is that the player will be able, having heard the preliminary part of the series, to actually initiate movement in synchronism with the calling of the critical place number. Starting from this conception, the reader may be surprised that in Table 1 all of these averages are plus, indicating that the charge took place after the signal was called. However, it must be remembered that by the technique used the men had to move the body five or six inches forward before they were

TABLE 1

EFFECT ON THE SPEED OF CHARGE OF CALLING ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results on four men; speed scores in thousandths of a second)

Rate per min.	Number position in series 3d	4th	5th	6th	7th	Ave.
40	210	119	170	153	207	171
60	173	102	152	104	183	143
100	107	73	99	85	78	88
120	104	118	112	90	106	106
Ave.	148	103	132	108	143	127

TABLE 2

EFFECT ON THE PER CENT OF OFF-SIDES FROM CALLING ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results for four men.)

Rate per min.	Number position in series 3d	4th	5th	6th	7th	Ave.
40	19	28	19	14	17	19
60	14	22	25	39	31	26
100	6	8	31	22	28	19
120	17	19	14	25	25	21
Ave.	14	19	22	25	25	21

able to trip the triggers resting against their heads and thus record the charges. Hence, our averages do not indicate the actual moment of beginning the first movement of the body. We may reasonably assume that it requires about 100^s (.01 sec.) to push the body forward by the amount of six inches. There was no similar lag in the recording of the signal; therefore our results and averages may be taken to indicate a close matching of body movement with the critical signal count.

A clearcut result appears in this table. At the rate of 100 per min.

the speed is regularly faster for signal positions 4 to 7 inclusive, while for the third position the rate 120 is not significantly better. In terms of averages, as shown at the right of the table, 100 per min. shows a speed of 88s, while its nearest competing rate, 120, shows an average of 106s. The total average for all speeds and signal positions is 127s, which is 45 per cent slower than the result found for the rate of 100 per min.

In Table 2 the results on off-sides from calling anticipatory signals at different rates are exhibited. The values entered for the different signal positions are percentages for the four men. When the records from the multiple chronograph were measured up, each charge was of course considered in reference to its respective signal line. If it appeared that the charge came ahead of the signal line, then the distance ahead was measured (1 mm. equaled 1s) and that charge marked with a minus sign preceding it was placed in the data table (not reproduced in this report). Our Table 2, here presented, gives the per cent of minus charges. An example will make our method even more clear. There were nine charges by each man in the third position at the rate of forty per min., or a total of 36 charges at this signal rate and position. Of these 7 were "off-side" in that the record balls were found to have struck the drum a little ahead of the signal line. The amounts ranged from 21 to 156s. Seven of 36 is 19 per cent, which has been entered in Table 2 opposite the rate 40 and under position 3. In the total of 720 plays by individual men represented in this table it is found that 152, or 21 per cent, had to be classified for our purposes as off-side.

In anticipatory series of signals we may naturally expect action prior to the signal as well as following the signal. It is comparable to shooting at a moving target. Some shots will of course strike ahead, while other shots fall behind. For the anticipatory football signal the total charges will thus form something like a normal distribution about the actual temporal position of the signal, with probably the mode falling slightly behind, due in large part to the drastic football rule against charging too soon. Undoubtedly several of the 152 minus charges would have been called by an official watching the men.[1] But the great majority of these would easily fall within normal limits and not be challenged as "off-side."

If we judge from the averages at the right of Table 2, we might conclude that there is no difference in off-sides for the different rates. It happens that 40 and 100 each show 19 per cent, while 120 gives 21 per cent, and 60, 26 per cent; while the average for the entire series is again 21 per cent. But, as pointed out by Wilce, there is another and quite regularly acting influence that predisposes to off-side as is indicated in the horizontal line of averages at the bottom of

[1] See discussion under "Official Off-sides" near the end of this paper.

Table 2. When the charge is placed late in the signal series, the number of off-sides increases markedly. The psychological reasons are of course obvious. This urge to go therefore masks the influence from rate of calling, which probably can be best gauged in the results shown for positions 3 and 4 where the off-side tendency sinks to its lowest point at the rate of 100 per min. When the charge is placed later than position 4 in the series, no one rate of calling signals seems to possess a decided advantage, unless it is the very slow rate of 40 per min., which cuts down off-sides by pushing the whole response activity of the players to a slow tempo.

The results for unison of play are found by determining the speed variation from the average speed found for a particular rhythm rate and signal position. For example, the average shown for rate 40, position 3, in Table 1, was 210s. The difference between this and each of the charges made under this set of conditions was found, and the average of these differences taken, which amounted to 149s, see Table 3. Similarly, for each average shown in Table 1, a mean variation was found. These are combined in Table 3. They include every charge made, whether off-side or slow, under the several conditions of speed of calling and signal position. The indications of Table 3 are clear. The unison of charge is certainly best at the rate of 100, where the average is 72s. This is well ahead of the other three rates used. At the bottom of the page it is seen that the unison is poorer

TABLE 3

EFFECT ON UNISON OF CHARGE (M.V. OF SPEED) FROM CALLING ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results on four men; mean variation scores in thousandths of a second.)

Rate per min.	Number position in series					
	3d	4th	5th	6th	7th	Ave.
40	149	105	145	114	162	135
60	92	92	129	104	197	123
100	67	45	90	85	71	72
120	71	74	89	105	95	87
Ave.	95	79	113	102	131	104

when the charge falls late in the position series. The most unified start was found for charges on the fourth number at the rate of 100. This is in agreement with Table 1, for speed, and in substantial agreement with Table 2, for off-sides. If we treat these data much more elaborately, discarding extreme off-sides and extreme delays, and use standard deviation formula in place of the mean variations, it is found that the above conclusions are substantiated. Very slow and very fast rates of calling signals are not indicated as desirable, for they tend to make the men charge more slowly and more unevenly. The slow rate acts as a drag on the activity of the men, while it is difficult to adjust body movement to the very fast rate. The factors

of advantage appear to operate in the same direction and to give a significant difference in favor of a rate of 100 as against the other rates used in our experiments with anticipatory signals.

Results for Non-Anticipatory Signals

In these experiments the men knew only the name of the signal number. They did not know at what position in the series it would be called. Hence these results resemble simple reaction time tests. There is in the technique one difference, here the men had to move the body five or six inches forward before reaction was recorded, whereas, with the ordinary laboratory method, the simple slight movement of the finger serves for reaction response. The effect on speed of charge from calling non-anticipatory signals at different rates is indicated in Table 4. All of the values entered under the various number positions are averages for the four men, and are in terms of thousandths of a second. The total average for all rates, and signal positions is 426σ. This and the other results in Table 4 correspond fairly well

TABLE 4

EFFECT ON SPEED OF CHARGE FROM CALLING NON-ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results on four men; speed scores in thousandths of a second.)

Rate per min.	Number position in series					
	3d	4th	5th	6th	7th	Ave.
40	473	470	415	431	467	451
60	460	418	424	420	417	428
100	411	397	392	400	383	397
120	443	378	401	485	433	428
Ave.	447	416	408	434	425	426

TABLE 5

EFFECT ON PER CENT OF OFF-SIDES FROM CALLING NON-ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results for four men.)

Rate per min.	Number position in series					
	3d	4th	5th	6th	7th	Ave.
40	0	0	0	0	6	1
60	0	0	0	3	8	2
100	3	0	3	8	3	3
120	0	3	6	14	14	7
Ave.	1	1	2	6	8	3

with those published in Tables 1 and 2 in the previous article. In the present experiments the men were probably more cautious and not so much in the spirit of competition as was the case in the tests reported in the former paper. We see a gross difference of 300σ between the average for non-anticipatory and the average for anticipatory signals. In one case the auditory-perceptual process has to be delayed until the signal is actually given. In the other case (anticipatory) the tempo and the vocalized numbers altogether constitute the signal.

In these experiments with non-anticipatory signals it turns out that rate 100 gives on the average the fastest charging time, 397s compared with 428s as shown by rates 60 and 120. This is not a very pronounced lead, but seems to be consistent for in four of the five positions used the 100 rate is found to give the fastest speed.

There were only one-seventh as many off-sides as were found in the anticipatory series. These results are given in Table 5. They indicate that the men were highly cooperative, regarded instructions, and that we may practically neglect off-sides in discussing this experiment. One point may be noticed, the faster the rate of calling signals the more frequently off-sides occur, independent of the signal position. If we may draw any conclusion from this it would be against using the rate 120 in non-anticipatory series.

The results for unison of charge with non-anticipatory signals are given in Table 6, where we have tabulated the mean variations for the speed averages shown in Table 4. The M.V. values range from 46 to 200s, with a total average of 95s. This is a little smaller than

TABLE 6

EFFECT ON UNISON OF CHARGE FROM CALLING NON-ANTICIPATORY SIGNALS AT DIFFERENT RATES

(Combined results for four men; mean variations of speed scores in thousandths of a second.)

Rate per min.	Number position in series					
	3d	4th	5th	6th	7th	Ave.
40	84	55	53	73	129	79
60	82	46	69	71	106	75
100	89	81	51	107	98	85
120	82	83	97	251	200	143
Ave.	84	66	68	126	133	95

found for anticipatory signals, as indeed might be expected. With the non-anticipatory signals the players respond, supposedly, to a given auditory signal; while with the anticipatory instruction they respond to their time or rhythm estimate of the position of a signal. It is noteworthy that the two series agree so well, and this is evidence that the anticipatory signal is as workable in practice as is the older specific-stimulus signal.

The unison results turn out most unfavorable to rate 120, whereas the other three rates fall fairly close together with averages well below 100s. The signal rate of 60 shows the best unison, 75s, and gives its smallest value, 46s, at position 4. Rate 40 gives an average of 79, and has very low values at positions 4 and 5. Rate 100 gives an average of 85, and shows a low point of 51 at position 5. Considering unison and speed the rates of 60 or 100 are better than 40 or 120. But neither 60 nor 100 is clearly in the lead: 100 gets quicker action, and slightly poorer unison; the opposite is found with 60. Possibly there is a better rate than either, that might fall in the

vicinity of 80, which is not represented in our experimental conditions. We must conclude that the specific rate of calling signals if between 40 and 100 is not as important in giving non-anticipatory as it is in giving anticipatory signals.

Value of Place Position

In the six preceding tables the data have been presented in reference to the position of the charging signal in the series of numbers called. For anticipatory signals we found the fastest speed and the best unison at position 4, with the rate of 100 digits per minute. It appears that the rate of calling the signals is a potent factor in producing both speed and unity, and is more important than the simple matter of signal position. In terms of averages the fourth position was best in speed for all rates, and best in unison for all rates. With non-anticipatory signals speed was fastest on the average at position 5, with position 4 appearing as a close second. The results for unison, as exhibited in Table 6, show the best average in position 4, with position 5 as a close second.

For a signal position the general results from the two series therefore indicate that 4 or 5 are rather definitely more favorable than positions 6 or 7. In some instances position 3 shows a close comparison with 4. The real basis of this preference or of these differences is probably not to be thought of in terms of a "number position," but rather in terms of the amount of time elapsing from the moment the players get set and the signal series is started until they respond with action. Making ready and holding the stance for a period of seconds constitutes a strain, which is in part muscular, but in large measure is a matter of attention, and therefore a psychological effort. Enough time must be allowed for adequate neuromuscular organization, and if the starting signal is called too quickly after the set signal the result is going to be less favorable. On the other hand, the charging result will also be unfavorable if too much time is allowed between the set signal and the starting signal. The results indicate that from 2 to 5 seconds after the men have set represents the best time duration within which to locate the starting signal. The rate of 100 digits per minute, or with non-anticipatory signals of 60 digits per minute, appears to break up this interim between set and start most favorably for the control of the attention of the player. These statements of course apply only to the offense players.

Perhaps one reason why the fourth number in the series is preferred, and tends to produce better speed and uniformity, is that notwithstanding all due care in giving the signals, the players nevertheless tend to experience subjective rhythmic grouping. Grouping in pairs (1-*2*, 3-*4*) is of course the simplest illustration of this tendency,

and since the fourth count would allow the completion of two such groups, it is the first repetition of the subjectively stressed item and would thus be favorable for attention and action. At other number positions more elaborate grouping systems could be used, but they are of course less likely to be hit upon by the players.

Signals in Non-Rhythm

Some have held that the use of rhythm in vocalizing the signals is undesirable, because, they claim, it tends to make the men mentally lazy. These coaches have the conviction that the players do not give close attention to rhythmic signals. Our next experiment is designed to test the validity of this contention, and if possible to discover whether faster and more uniform charges with fewer off-sides actually result from calling the signals in non-rhythm. Our regular four players served also in these trials. Forty-five separate charges were recorded for each man to the anticipatory non-rhythm signals, and the same number to the non-anticipatory non-rhythm signals. Thus there were in all 90 charges for each man, or a total of 360 charges, 180 in each series. The routine was to call a series of 5 single-digit numbers with irregular time intervals between digits. In the anticipatory signals the players were told beforehand, for example, "You are to charge on the third number called." The actual digit would be 2. At another time they were told, "You are to charge on the fourth number called," and here also the actual digit spoken in the fourth position would be the number 2. In like manner all five positions of the number series were used under similar conditions. A series of only five digits was called in place of seven, as used in the preceding experiments with rhythm.

In the non-anticipatory trials the men were told, "You will charge when you hear the digit 2 called." Then they listened only for 2, and charged as soon as possible after hearing this number, no matter in what position in the series of five it might come. The experimenter carrying through a routine called the digit 2 in various positions so as to have all five places properly represented in the test results.

The men were placed with care as before in front of the charging frame, and were given a number of practice trials before each afternoon's recording began. This was to eliminate warming-up effect. In charging the men were required to prolong the charge to a distance of at least 3 to 5 feet. They were cautioned to charge in reference to the signal and not in reference to any movement of other players. After charging they returned promptly to their positions in front of the trigger boards, ready for the next starting signal. (In none of our experiments did the players inspect the records following each charge, nor were they given information on how well they were doing

individually, or on how they compared with each other. In the tests reported in the previous papers by the senior author the men did look at the records between charges.)

The actual time intervals between digits varied from 0.5 to 1.5 sec. This represents the same time range used before in the rate of 120 to 40 digits per minute. But here the time intervals were irregularly used, with the pattern of irregularity made up in advance and adhered to as closely as possible by the one calling the signals.

The average results for the four players from this exeriment are presented in Table 7. Here it will be seen that the speed of charge for the anticipatory series averages 452s; while for the non-anticipatory the average was 523s. In general, then, the men got away about .07 sec. faster when they knew beforehand the position number on which they were to charge. They could charge as soon as that number was called, irrespective of the identity of the digit called. (The digit was always the same, 2, but they did not have to hear it through.) The direction of the differences (faster speed with anticipatory signals) is born out at each of the five signal-number posi-

TABLE 7

SPEED, OFF-SIDES, AND UNISON OF CHARGE FROM SIGNALS GIVEN IN NON-RHYTHM

(Speed in thousandths of a second; off-sides in per cent; unison in mean variations of speed scores.)

Kind of Signal	Measure	Number Position in Series 1	2	3	4	5	Ave.
Antic.	Speed	470	459	449	443	441	452
Non-Antic.	Speed	640	538	460	498	478	523
Antic.	Off-sides	6	0	25	6	6	8
Non-Antic.	Off-sides	0	3	6	17	3	6
Antic.	Unison	100	54	187	92	107	108
Non-Antic.	Unison	85	74	82	193	103	107

tions. It is particularly striking at position 1, showing that to know beforehand the charge is to occur on the first number called permits the player to pre-organize for the response immediately after the set signal and so be more prompt in his action. The speed scores for our anticipatory signals given in non-rhythm show very slow action compared to the results in Table 1, and are also slower than those found characteristic in Table 4, where non-anticipatory signals were called in rhythm. Giving non-anticipatory signals in non-rhythm produces a signal system that begets changes as clumsy and slow as the system is clumsy in description. The players, if they follow instructions, cannot pre-organize their response. They must simply wait until they hear the specified digit pronounced and then they must subjectively check themselves on this auditory impression to make sure that they are correct before starting. Giving signals in non-rhythm

therefore turns the usual anticipatory series into something like, but poorer than, the non-anticipatory series given in rhythm.

In reference to off-sides it will be seen from Table 7 that the results correspond fairly well with, but are not better than, those found for non-anticipatory signals presented previously in Table 5.

The results for unison are shown at the bottom of Table 7. Both types of signal here used give similar average unison scores, average 107s. Due largely to the irregularity in off-sides shown for positions 3 and 4, the unison results are quite irregular for the different number positions in the series. Position 2 is the favored one according to these experiments. Our non-rhythm results for unison correspond fairly closely with the general average for anticipatory signals in rhythm Table 3. But it is obvious from inspection of Table 3 that, for example, at rate 100 the unison is more favorable than we have found in non-rhythm signals. The same may be said when we compare against Table 6, non-anticipatory signals given in rhythm. Here the rate of 60 per minute certainly produces unison results in general superior to those which we have gotten from non-rhythm, while showing also faster speed. Our experiment with signals given in non-rhythm therefore indicates that this arrangement produces a marked slowing in speed without achieving any increase in unison. In fact, unison of charge seems to have been slightly sacrificed. Off-sides are admittedly few with this arrangement, but not, we believe, fewer than is generally characteristic for the non-anticipatory signals called in rhythm.

Verification Experiment

Every psychologist and every coach knows that the element of individual difference between players may lead us astray in our thinking and undermine the structure of generalization erected from experimental tests. There is an old proverb which reads, "What one fool can do another can." But it doesn't say which other. You have to pick your man, rather than having just any man taken at random sent to you from the scrub squad. To guard against errors in generalizing on the more intensive work with the four players who served in our tests, it seemed desirable to repeat a certain part of the work on seven new players selected with a view to including a wider range of variability. Two series of signals were employed in this check or verification experiment—(1) anticipatory, called at the rate of 100 digits per minute in rhythm; and (2) non-anticipatory, called at the rate of 60 digits per minute in rhythm. The procedure was the same as outlined for the experiments on the four men reported in the earlier part of this paper. However, there were two new features which made the entire series correspond more closely to actual play of football: (1) one man was center and was required to pass

the ball. Therefore the men not only charged to the sound of the spoken signal, but also theoretically with the ball.

Arrangements for recording the movement of the ball were made very simply. One of the charging triggers was extended to within about seven inches of the ground. The weight of this long trigger was made equal to that of the others on the frame. A heavy cord was attached three inches from the lower end of this trigger, and passed forward to a pulley placed nine feet immediately in front of the trigger. From here the cord came back and passing directly below the trigger was attached to the football. The backward movement of the ball, drawing the cord around the pulley, served to displace the trigger forward, as other triggers were pushed forward by the heads of the players. The ball-trigger had to be moved in this manner a distance of six inches at the bottom to trip the latch and record. Thus the ball had to be moved over the same distance that the men charged in order to register.

The instructions were the same as in our earlier experiment. And in addition players were cautioned not to watch the ball, but to listen for the signal. The center was instructed to pass the ball upon hearing the starting signal, regardless of the off-sides. Anticipatory signals were used one afternoon, and non-anticipatory signals the next afternoon. The experiment lasted over four days. Preliminary trials for both types of signals were conducted before the experiment was started so as to reduce practice effect. A total of 840 reactions were recorded, 420 for anticipatory, and 420 for non-anticipatory signals. The plan was to call a series of seven digits, and the starting might be in any position 3 to 7 inclusive. All the five positions were tried an equal number of times.

Finally in these experiments there was the new feature, (2) the use of an official to record off-sides. This man thoroughly understood the duties of a head lineman. His instructions were as follows: "You will station yourself at one end of the line. You will note carefully whether any of the men charge ahead of the ball. If any man so charges you must record his number and position in the proper space on this sheet." It was possible later to compare off-sides as recognized by the official against the technical off-sides recorded by the multiple chronoscope.

The results for this verification experiment are recorded in Table 8, which is arranged essentially as the previous tables have been. When we compare the charging speed for the two kinds of starting signals on the seven new players, we see that there is not the slightest doubt but that the anticipatory signal, as shown in our earlier experiments, permits the men to get away quicker after the signal is spoken. These later average values, 82^{s} and 408^{s}, compare very favorably with the averages for the comparable digit rate and signal

TABLE 8

COMPARISON OF ANTICIPATORY AND NON-ANTICIPATORY SIGNALS WITH A GROUP OF SEVEN MEN

(Speed of charge in thousandths of sec.; offsides in per cent; unison in mean variations of the speed scores.)

Kind of Signal	Rate	Measure	Number Position in Series					
			3d	4th	5th	6th	7th	Ave.
Antic.	100	Speed	88	100	67	73	80	82
Non-Antic.	60	Speed	464	362	412	412	392	408
Antic.	100	Off-sides	21	5	10	15	10	12
Non-Antic.	60	Off-sides	10	15	11	13	25	16
Antic.	100	Unison	85	68	81	68	72	75
Non-Antic.	60	Unison	103	109	100	108	120	108

series shown in Table 1 and Table 4. When we consider the results for unison of charge as shown in the lower part of Table 8, we find an average for the anticipatory charge of 75^s, and for the non-anticipatory of 108^s. In Table 3, opposite the rate of 100 per minute, we find the average of 72^s for anticipatory signals; and for the non-anticipatory in Table 6, opposite the rate of 60 per minute, we find 75^s. Therefore, we see that in this latter experiment the results for unison, while in general confirmatory, have turned out a little differently and show up poorer for the non-anticipatory signals.

From the former experiments, those on the four players, we judged that off-sides were more frequent in the anticipatory signals, an average of 21 per cent compared with an average of 3 per cent in the non-anticipatory series. Our experiment with the seven players gives conflicting results. We find an average of 12 per cent for the anticipatory, and 16 per cent for the non-anticipatory. It therefore results that in terms of averages for speed, off-sides, and unison of play, the anticipatory series of signals gives generally better results than the comparable non-anticipatory series.

Our verification experiment does not give as clear-cut a result in reference to the matter of number position preference as seemed to be indicated in the former tests. However, taking Table 8 all in all, it appears that the positions 4 or 5 are the favorable locations for the charging signal in the series of seven digits. We may conclude that our verification experiment has in general supported the findings which resulted from a more prolonged series of experiments on four trained subjects.

Official Off-Sides

In the foregoing experiment it was planned to have an official stand at the end of the charging line and carefully note all of the off-sides; that is, whenever a player actually started his charge before the movement of the ball. This plan was carried out in the tests with anticipatory signals, but unfortunately the official was not able to be present when the non-anticipatory signals were employed.

For comparison of registered off-sides against the judgments of the official, we took a group of 188 charges that were registered on the records as technically off-side, compared with the moment when the ball started motion. The distribution of these off-side plays in terms of the observations of the official is given in Table 9. The total

TABLE 9

OFF-SIDES WITH RESPECT TO THE BALL AND AS CALLED BY THE OFFICIAL.

Total off-sides compared with ball	Called off-side by Official			Missed by official
	Total	Correct	Incorrect	
188	78	56	22	132

number, 188, is entered at the left. During the period of play when these 188 off-sides were made, the official called a total of 87 charges "off-side." When we take his number and compare the individual plays against the records, we find that in 56 instances he was correct; but 22 of his group of plays called off-sides were not off-sides, according to the records. And he wholly missed calling 132 plays that were actually off-side in comparison to the movement of the ball.

If we examine the time values for all of the off-side plays which were correctly noted by the official we find that they range from 136 to 200s, while the average time of the off-side charges which were not detected by him was 61s. From these tabulations we may conclude that for an off-side to be distinct and quite recognizable by an official it must precede the ball by approximately 150s. The distance that an average player would cover in this time interval of 150s would be about 10 to 12 inches.

Disadvantage of Watching the Ball

The best generally arranged starting signal is obviously the one which gives the fastest get-away, the best unison of action among the players, and the minimum number of off-sides. If the players start ahead of the ball, official penalty may be given; if they start behind the ball the defense may punish them. The optimum situation is to have them start exactly with the ball. If we examine the charges of the players in reference to the movement of the ball for anticipatory and non-anticipatory signals, we arrive at what seems a critically important comparison. Taking the average time of all the legitimate charges compared with respect to the ball, for the anticipatory series we find that the men get off 2s behind the ball; whereas, for the same comparison with non-anticipatory signals they get off 77s behind the ball. This difference of 75s between the results for two types of signals represents something like 5 to 8 inches of possible charging movement. An offense team, using non-anticipatory signal series, is handicapped because the center responding to the same signal which all the men hear can easily pass the ball more quickly than his team mates can move their whole bodies ahead in charging. Therefore the defense team playing against them will profit by watching the ball, which will lead them to charge slightly earlier than if they

had watched their opponent linemen. The use of anticipatory signals given at suitable rates therefore has the important advantage that the charge of the linemen, without their watching the ball, tends to be in perfect time register with the movements of the ball.

Summary

1. The speed, unison, and off-sides of football charges were examined by means of a time-measuring device called a multiple chronoscope, which is used on the football fields and can measure as many as seven players at once, arranged in regular football line formation.

2. Anticipatory (charging for example on the fourth number called) and non-anticipatory (charging when a specified digit is called) signal systems were examined and compared. These signals were called at four different rhythm rates, 40, 60, 100, and 120 digits per minute.

3. Reaction to anticipatory signals is of course much more prompt than to non-anticipatory, 127 compared to 426σ.

4. Off-sides are rather more numerous with anticipatory signals.

5. Unison of play is somewhat better with anticipatory signals, since the individual differences in reaction time do not show up so prominently.

6. The rate at which the signals are called makes a very great difference. The favorable rate for anticipatory signals is 100 single digits per minute, while for non-anticipatory signals the best rate appears to be about 60 single digits per minute.

7. The best position for a starting signal within a series of digits appears to be from about two seconds to five seconds after the men have set. This ordinarily falls on the fourth or fifth digit called. Off-sides are considerably less when charging occurs early in the series of digits. This applies to both kinds of signals.

8. Calling digits in non-rhythm converts the ordinary anticipatory series into one producing much slower speed, and gives get-away at about 450σ after the signal. Non-rhythm also slows up the usual non-anticipatory series by an amount equal to 20 to 25 per cent. Non-rhythm does not appear to increase off-sides, but the contrary. However, it does produce poorer unison of charge.

9. The per cent of technical off-sides is much larger than might commonly be expected. The ordinary official can detect probably less than one-third of them. Off-sides must apparently have a temporal displacement amounting to about 150σ ahead of the ball, to be correctly observed by an official.

10. In anticipatory signals the players tend to start the charge at the same moment when the ball starts in action; whereas in non-anticipatory signals they get away almost one-tenth of a second after the ball has moved. This fact gives their opponents a real advantage, and counts strongly against non-anticipatory signals in general.

The Development of Measures of Pupil Achievement in Physical Education

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PHYSICAL education is now included in all modern school curricula. There has been a steady increase in the amount of time devoted to this subject. Better and more abundant equipment is provided. Our teachers are better trained than ever before, both as to general and as to professional preparation. The modern school program in physical education is a vast improvement in most respects over the old formal programs common not so many years ago.

The subject matter and methods of physical education have been improved and enriched. Our teachers are in step with general educational practices. Their educational philosophy has been enriched and their viewpoint enlarged. Our most modernly trained teachers are basing their instruction upon the latest scientific information, particularly in the field of educational psychology.

Up-to-date present day curricula consider individual differences as never before. Instruction is directed at specific objectives. These are being set up from the viewpoint of students. Subject matter and methods are being selected and shaped in accordance with these specific objectives.

In keeping with the scientific approach characteristic of this age, education is being continually improved from the standpoint of the attainment of specific results, i. e., objectives. The test and measurement movement in education is evidence of this.

Continued progress and improvement in the method and results of physical education instruction depend largely upon our skill in measuring or evaluating the changes made in pupils, that is, in measuring the effect upon the pupils of the activities and methods of our physical education curricula.

The measurement of pupil achievement is, therefore, of primary importance. For this purpose accurate or objective tools are needed. In regard to this need we must admit that physical education has not yet reached the point common to most of the other subjects in the curriculum. No educational survey has yet measured pupil achievement in physical education in ways at all comparable to those applied to other school subjects.

There are doubtless many reasons for our failure to adequately measure pupil achievement in physical education. For one thing, measurement depends upon tools or yard sticks and our tools or tests for measuring achievement in physical education are limited in number, of recent origin, and yet far from perfect. Until recent years, workers in this field did not generally have the type of training to enable them to carry on the necessary statistical research, or, in fact, to be interested in doing so. The older viewpoint which regarded physical education as a remedial health program rather than as an educational procedure has been partly responsible for delays.

Another reason for lack of better progress in measuring pupil achievement has been the rapid changes in physical education as regards activities and methods. However, the greatest obstacle has doubtless been the real difficulty of the task. Physical education is more than a school subject. It is a way of education. The measurement of pupil achievement in physical education involves measuring activities as different from each other as reading is from arithmetic or art. This point will be readily apparent when we remember that such activities as athletics, dancing, games, stunts, boxing, individual gymnastics, to mention a few only, are all included in physical education.

A brief review of the history of measurement in physical education is contained in the recent book by Bovard and Cozens on "Tests and Measurements in Physical Education." It will be seen that early efforts at measurement were directed as measuring growth and development. The invention of two tools, the spirometer and the dynamometer, doubtless had some effect in causing the shift, in about 1880, from interest in measuring bodily size to interest in measuring the actual work of an individual. Sargent, in about 1873, began to test bodily strength. It was supposed at this time that exercise could be prescribed on the basis of muscle size. Other workers, Seaver, for example, pointed out that strength tests do not measure many valuable attributes, and practical experience pointed out that the strong man very often cannot use his strength to the best advantage. Although the use of strength tests has been revised by F. R. Rogers, who has shown them to be a valid measure of general athletic ability, the failure of such tests to measure achievement in special skills will be referred to later.

Considerable experimental work was done in developing functional tests but it was not until about 1894 that interest in measuring how well students could do certain physical activities was manifested. Meylan began in 1904 to test ability in running, jumping, vaulting, climbing and similar activities. Since he made these activities a part of his physical education program these can be said to be achieve-

ment tests, that is, they were tests of the achievement of students in mastering the skills or abilities required.

A large number of workers have contributed efforts to measure pupil ability or achievement in single events, particularly of the track and field type, since these lent themselves readily to objective measurement. Only in the last few years, however, has much been done toward the development of batteries of tests for measuring pupil achievement in game skills. Such tests were proposed by the speaker in 1924 and 1925.*

The scope of this paper will not permit an attempt at evaluation, if such were possible, of the many tests which have been proposed for measuring pupil abilities in physical education. It will be necessary, however, to discuss achievement tests and to discuss some of the available data relating to the measurement of pupil achievement in physical education.

An achievement test is a "test which measures a pupil's learning, mastery of, or ability in, a specific skill, knowledge or bit of subject matter." Such a test measures what a child has learned rather than his capacity to learn. Achievement and ability do not mean quite the same thing. "Ability is the actual power to perform any act, whether inherited or acquired." Achievement indicates a level of ability attained at some specific time.

In measuring pupil achievement we are trying, therefore, to measure the amount of learning that has taken place as the result of the physical education instruction pupils have received. In order to measure improvement or achievement, it is necessary to measure pupil ability before instruction starts and then to measure the same ability at a later time after instruction has been given. Improvement made on the final testing over the initial testing constitutes achievement, provided, of course, that our tests are valid and reliable.

Up to the present time, we have not really done much toward measuring pupil achievement in physical education. Some schools have, it is true, given repeated testings year after year in certain athletic events. Decathlon tests as used in Detroit, California and elsewhere are illustrations.

However, adequate measurement of pupil achievement implies that specific objectives have been set up, that instruction has been directed toward the attainment of these objectives, and that the amount of this attainment or achievement is measured by comprehensive application of achievement tests. Since a large part of the physical education program deals with games, sports and recreational skills, it will be apparent that we have been especially negligent in measuring pupil achievement in these activities.

Standardized achievement tests are needed. Much of the measure-

* Wardlaw, C. D., "Fundamentals of Baseball," Chapter VII "Testing the Mechanics of Baseball," Brace, Scribners, 1924. American Physical Education Review, April, 1925

ment of pupil abilities has been done by poorly constructed tools. This discussion and demonstration will endeavor to point out some of the characteristics of a good achievement test.

Among recently developed test procedures we have some fairly reliable tests of general ability. The Rogers strength index, the Cozens tests of general athletic ability and the Brace Scale of Motor Ability Tests are illustrations. These tests do not measure identical abilities but they all give an indication of individual differences as regards general motor ability. None of the above tests, however, measure achievement in specialized skills, particularly game skills. These tests are constructed and validated to be given as a unit.

The only one of these tests which lays any claim to use as a measure of specialized achievement in game skills is the Cozens battery of tests used in measuring general athletic ability of college men. This battery includes four tests which might appear to measure game skills, namely, baseball throw for distance, football punt for distance, quarter mile run, and dodging. Our experience with achievement tests in game skills, however, leads us to be very doubtful of the validity of the football punt for distance as a measure of skill in football or other athletic games. Our experiments with football achievement tests show that about ten tests are needed to measure achievement in this sport. Probably at least four or five tests are needed to measure achievement in baseball. It seems highly doubtful if any of the tests in this battery adequately measures achievement in basketball, and so on for other game skills.

The battery of tests, as a whole, is, however, an excellent tool to use in classifying men as to general athletic ability. But the validity of separate elements of this battery to measure achievement in specialized athletic skills appears questionable.

Certainly neither the Brace Scale of Motor Ability Tests nor the Rogers Strength Index measures achievement in specialized game skills. As further proof of this we should cite some of the correlation coefficients which the authors of these tests have found to exist between the tests, as a whole, and the tests of game skills. These correlations are as follows:—

Cozens:

					(criterion)	
Correlation	of	composite	score	with	football punt	.627
"	"	"	"	"	baseball throw	.723
"	"	"	"	"	quarter mile run	.707
"	"	"	"	"	dodging	.729
"	"	"	"	"	basketball throw for goal	.285
"	"	"	"	"	football pass for accuracy	.450
"	"	"	"	"	ball catch	.460
"	"	"	"	"	rope climb	.544
"	"	"	"	"	drop kick	.521

Brace:

R for motor ability score with six	basketball achievement tests	.24
" " " " " "	baseball achievement tests	.168
" " " " " "	soccer football achievement tests	.31
" " " " " "	indoor track events	.56

Rogers:

Basketball foul throws, baseball throw and football pass at a target were experimented with but were discarded as having little validity.

It will be seen from these data that achievement test scores have a relatively low correlation with the best measures of general athletic ability that we have. These low correlations may be due in part to low reliability of the game skill tests used. It is our opinion, however, that the principal reason is that the two types of tests do not measure the same abilities. Practical experience in the use of batteries of achievement tests in game skills such as those of basketball for purposes of measuring ability in basketball has shown the tests to have a high degree of validity. At least two studies have shown basketball achievement tests to have better than ninety per cent accuracy in classifying players for competition.

The tests of general ability mentioned are valuable for purposes of general classification. They are not as accurate as specialized achievement tests for measuring ability in activities where continued learning or practice is needed to develop ever increasing degrees of skill.

While natural ability is, of course, a factor in developing skill in game techniques, what achievement tests measure is the degree of ability that has been attained as a result of practice. It is important that these abilities be measured if we are to properly evaluate pupil achievement in physical education.

We frequently hear of suggestions that such tests as the Strength Index be used as a basis for the re-direction of the physical education program. Such practice does not seem justifiable or scientific on the basis of data at hand. The activities of physical education are many and varied. Adequate re-direction of physical education must be based upon information as to pupil achievement in the specialized abilities concerned, because, certainly, one of the important aims of physical education is the teaching of neuro-muscular skills in educative and recreational activities.

Some of the physical education activities in which achievement tests are needed are as follows:—

1. Dancing and rhythmic activities (all forms).
2. Games and athletic sports such as: (*a*) Simple games; (*b*) Highly organized games; (c) Sports, as football, basketball, baseball, volleyball, tennis, handball, golf, swimming, soccer, field hockey, speedball, etc.

3. Self testing activities, such as tumbling, stunts, apparatus exercises, boxing, wrestling.

Satisfactory achievement tests must meet the criteria of a good test of which validity, reliability and objectivity are the most important. A good test must have certain characteristics if it is to meet these criteria, although, of course the final determination of the extent to which these criteria have been met involves the use of statistical procedures.

Experiment on the Relation of Posture to Weight, Vital Capacity and Intelligence

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OF the many factors considered related in some way to posture, these three—weight, vital capacity and intelligence—were singled out for this brief experiment.

In any effort to determine values in relation to posture, we are immediately confronted with the lack of valid, objective methods of scoring. The method used here is Miss Bancroft's "Straight Line Test"* applied to silhouettes. The points which should fall in a "straight line" are the tragus of the ear, the point of the shoulder, the head of the femur and a point two inches in front of the malleolus. An effort was made, therefore, to mark these points. Strap harnesses were devised—one for the head, one for the shoulder, one for the hips. To the end of a piece of rubber webbing, a buckle was fastened; in the center was attached two small steel rods soldered together so that they crossed each other. For the silhouette, the point of intersection of the rods was placed in each case, over the point to be used in measuring and held in place by the the strap buckled around the body. The rods projected out beyond the body outline and were therefore shown as black lines in the silhouette. For the picture, a side view, the girl was asked to assume her best standing position. Upon the finished print, the lines of the rods were continued across the body with white ink, thus giving the straight line points. Lines were then drawn connecting these points and the point on the ankle. If the individual's posture was perfect, these points were directly over each other, making a straight line perpendicular to the base.

The angles of deviation from the perpendicular were then measured by a protractor (Illustration I). The angles measured were:

1. The angle of deviation of the point of the hip from the perpendicular.
2. The angle of deviation of the shoulder point from the perpendicular.

* Bancroft, Jessie—"The Posture of School Children"; MacMillan Co., 1920.

3. The angle of deviation of the ear point from the perpendicular.
4. The angle of deviation of the shoulder point from the hip point.
5. The angle of deviation of the ear point from the shoulder point.

The point falling ahead of the perpendicular was given a plus degree score and the point falling behind the perpendicular was given a minus degree score.

ILLUSTRATION I

Method of measuring angles of deviation

ILLUSTRATION II

Silhouette showing strap harness marking "straight line" points.

ILLUSTRATION III

Strap harness used.

The "per cent position" method was used to construct a scoring table (Table 1) for the different angles. For instance, the deviations of silhouette No. 882 were (Illustration 2):

Score	16	27	33	38	43	47	50	54	57	63	68	74	83	100	83	74	68	63	58	54	50	47	43	36	33	27	16
					Minus Degrees													plus Degrees									
Forward Tilt Hip Angle	6.5°	6.0°	5.5°	5.0°	4.5°	4.0°	3.5°	3.0°	2.5°	2.0°	1.5°	1.0°	0.5°	0°	0.5°	1.0°	1.5°	2.0°	2.5°	3.0°	3.5°	4.0°	4.5°	5.0°	5.0°	6.0°	6.5°
Hot Shoulder Angle	6.5°	6.0°	5.5°	5.0°	4.5°	4.0°	3.5°	3.0°	2.5°	2.0°	1.5°	1.0°	0.5°	0°		0.5°		1.0°			1.5			2.0°		2.5°	
Left Hip Angle			5.5°	5.0°	4.5°	4.0°	3.5°	3.0°	2.5°	2.0°	1.5°	1.0°	0.5°	0°	0.5°	1.0°	1.5°	2.0°	2.5°		3.0°	3.5°	4.0°	4.5°	5.0°	5.5°	
Chunky Hip Angle	13°	12°	11°	10°	9°	8°	7°	6°	5°	4°	3°	2°	1°	0°	0.5°	1.0°	1.5°	2.0°	2.5°		3.0°	3.5°	4.0°	4.5°	5.0°		
Left Shoulder Angle	6.5°	6.0°	5.5°	5.0°	4.5°	4.0°	3.5°	3.0°	2.5°	2.0°	1.5°	1.0°	0.5°	0°	3°	6°	9°	12°	15°	18°	21°	24°	27°	30°	33°	36°	

TABLE 1

Scale of Posture Scoring

	Angle of Deviation	Score*
Horizontal hip deviation	3	54
Horizontal shoulder deviation	— .5	85
Horizontal ear deviation	1	74
Hip-shoulder deviation	—8.5	47
Shoulder-ear deviation	11	63
Total score		323

* This is obtained by referring to Table 1.

These scores were then correlated with the per cent over-weight or under-weight that the girls were found to be. The Baldwin age-height-weight tables were used, slightly altered, for the nude weight. The per cent is computed by subtracting the normal weight from the actual weight and dividing the difference by the normal weight. The resulting correlation was $.027 \pm .047$.

The vital capacity was measured by the standard wet spirometer. This is taken as a part of the routine physical examination. Each girl was given an opportunity to observe the girl preceding her and she was allowed one trial preceding her test trial. The correlation between posture and vital capacity was: $.048 \pm .047$.

The intelligence rating was obtained from the scores made in the American Council of Education test. The correlation between posture and intelligence was: $.014 \pm .047$.

Conclusion: As the correlations were so low as to be of practically no value, this brief experiment would seem to indicate that there is little, if any, relation between posture and weight, posture and vital capacity, and posture and intelligence.

Comparison of the Rules and Regulations of State High School Athletic Associations of the United States*

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Introduction

THIS study analyzes the constitution and by-laws and rules and regulations of state high school athletic associations. In the way of reference, a study which deals with high school athletic regulations, by R. L. Hunt, is available. Mr. R. E. Rawlins, secretary of the National Federation of High School Athletic Associations, also furnished some valuable information for this study. He has not compiled a study but his long service in state and national associations furnishes a wealth of data.

This study was based upon the following materials:

1. The constitution and by-laws of forty-seven state high school athletic associations.
2. The form reports and eligibility blanks of the forty-seven states.
3. The constitution and by-laws of the National Federation of State High School Athletic Associations.

Repeated attempts to get a copy of the constitution and by-laws from the State of Nevada were fruitless. Therefore, in this report forty-seven states are considered unless special mention is made of Nevada.

The rules and regulations of the constitutions and by-laws were tabulated by states. Sixty-nine classifications were used in tabulating rules and regulations. Forty-one of these rules and regulations were of sufficient frequency to warrant placing in tables. Mention was made of some other rules and regulations in passing.

In the tables which follow the names of the states are used in preference to the name of the high school athletic association.

All the tables used in this study are compilations from the constitutions and by-laws of the state high school athletic associations. These tables summarize the rules and by-laws as they are found in the different constitutions and by-laws.

* A graduate thesis submitted at the State University of Iowa. The writer is indebted to Dr. P. E. Belting, former Director of Athletics, State University of Iowa, and to Dr. E. T. Peterson, Associate Professor in the College of Education of the University, for assistance in the direction of this study.

Part I

Nomenclature, Membership and Objectives

Names of Associations

The states have twenty different names for their athletic associations. The following twenty-one states have the "High School Athletic Association" for their name: Alabama, Florida, Idaho, Illinois, Indiana, Iowa, Kentucky, Louisiana, Massachusetts, Michigan, Nebraska, New Mexico, Ohio, Oklahoma, Oregon, Rhode Island, South Dakota, Utah, Washington, West Virginia and Wyoming.

Five states have the name "State High School Athletic Association"—Arizona, Kansas, Minnesota, Missouri and Montana.

Three states, Delaware, Pennsylvania, and Wisconsin, have the name "Interscholastic Athletic Association."

Two states, North Dakota and South Carolina, have the name "High School League."

The remaining states have different names as follows: "Arkansas Athletic Association and Arkansas Inter-School Contest Association," "Maine Association of Principals of Secondary Schools," "New Hampshire Headmasters' Association Rules for Athletic Contests," "Georgia High School Association," "Colorado High School Athletic Conference," "Mississippi High School Literary and Athletic Association," "Connecticut Inter-Scholastic Athletic Conference," "California Interscholastic Federation," "Texas Interscholastic League," "Maryland Playground Athletic League, Inc.," "Tennessee Secondary School Athletic Association," "New Jersey State Interscholastic Athletic Association," "New York State Public High School Athletic Association," "The Headmasters' Club of Vermont," "The High School Athletic Association of North Carolina" and "The Virginia High School Literary and Athletic League."

Memberships in Associations

The membership fees for the different associations are arranged under two headings: (1) uniform membership fees, and (2) graduated membership fees. Under the former the state association has a set price for all schools, while the latter has a sliding scale which is dependent upon the size of the school.

New Hampshire has the lowest fee in the first class. They charge twenty-five cents. Utah has the highest fee in this class. Ten dollars is charged for membership.

The fees of South Dakota range from three to twenty-five dollars. This is the largest fee charged in the graduated group. It is also the highest fee charged in any of the states. Table 1 shows the schools using the uniform fees, and Table 2 shows the schools using graduated fees. Two states have no dues set. These states are North

Carolina and Maryland. In the latter case, however, individual persons may join the "Playground Athletic League" by paying one dollar per year.

In addition to regular membership fees some states make a charge for entering track meets and tournaments. In Louisiana a charge of fifty cents per person for entrants is made.

Sixty-two per cent of the states have a uniform fee.

TABLE 1

THE ANNUAL UNIFORM MEMBERSHIP FEES

States	*Fee*	*States*	*Fee*
Alabama	$ 7.50	Mississippi	$ 3.00
Arizona	2.50	Montana	5.00
California (per athlete)	.25	New Hampshire	.25
Colorado	5.00	New Jersey	5.00
Georgia	5.00	New Mexico	5.00
Idaho	5.00	Oklahoma	5.00
Illinois	2.00	Pennsylvania	2.00
Indiana	1.50	Rhode Island	3.50
Iowa	2.00	South Carolina	10.00
Kentucky	5.00	Tennessee	5.00
Maine	2.00	Utah	10.00
Massachusetts	2.00	Vermont	.50
Michigan	2.00	West Virginia	5.00
Minnesota	2.00	Wisconsin	5.00
		Wyoming	2.00

Thirty-four per cent of the states have graduated fees.

TABLE 2

THE ANNUAL MEMBERSHIP FEES GRADUATED

States	*Minimum Fees*	*Maximum Fees*
Arkansas	$2.00	$ 5.00
Connecticut	2.00	5.00
Delaware	.50	6.00
Florida	5.00	10.00
Kansas	5.00	20.00
Louisiana	2.00	15.00
Missouri	3.00	5.00
Nebraska	5.00	15.00
New York	2.00	10.00
North Dakota	1.00	3.00
Ohio	2.50	15.00
Oregon	2.00	5.00
South Dakota	3.00	25.00
Texas	1.00	8.00
Virginia	2.50	25.00
Washington	2.00	

(for schools with enrollment less than 150—one dollar more for each additional hundred in high school).

Objectives

Twelve state associations had no specific objectives stated. However, other states gave as their objectives a single sentence, short and concise, as did Florida; then others gave a long list of objectives stating several aims, such as we find in South Dakota.

The Florida constitution says, "The aim of the association shall be to foster athletics in the high schools of Florida."

The South Dakota constitution gave the following: "The purpose of this organization is to promote high school athletics, to stimulate fair play and by means of rules and regulations equalize athletic opportunity by standardizing qualifications of contestants, coaching, treatment of visiting teams, and generally to promote the athletic welfare of member high schools."

One of the best objectives was given by Ohio, as follows: "The purpose of the State High School Athletic Association shall be to promote pure, wholesome, amateur athletics in the schools of Ohio."

Summary

1. The state associations used twenty different names with frequencies as follows: twenty-one with the name "High School Athletic Association," five with the name "State High School Athletic Association," three with the name "Interscholastic Athletic Association," two with the name "High School League," and the sixteen remaining states with individual names.

2. The membership fees for the state associations are of two kinds:

a) Uniform—same price for every school in the state.

b) Graduated—price varies according to size of school.

c) The fees range from twenty-five cents to twenty-five dollars.

3. Thirty-five states gave the objectives of their associations, but the objectives offered by Ohio are sought by all associations. They follow: "Shall be to promote pure, wholesome, amateur athletics in the schools of Ohio."

Part II

Board of Control

Forty-seven states have boards of control. They vary in size from three to nineteen members. The median membership is six. The memberships of these boards are chosen from the high school principals, superintendents and coaches. They are chosen by popular vote either in person or by a mail vote, each school having one vote.

Sometimes members of state departments of education are chosen, usually the head of the department of physical education. Generally the term of office for members of the board of control is for a

period of three years. Where the states are divided into districts, each district has the same number of members chosen for the board. These districts choose their own representatives.

Delaware's schools have one vote for each dollar and each fraction of a dollar paid in dues.

Table 3 shows the number of members on boards of control and the officers for the different states.

TABLE 3

MEMBERSHIP AND OFFICERS OF BOARD OF CONTROL

	Number Members	President	Vice-President	Secretary Treasurer	Secretary: Paid Full Time	Secretary: Paid Part Time	Secretary: Non-paid
Alabama	9	1	0	(4)1-c-1	0	200	0
Arizona	4	1	0	1 0	0	0	1
Arkansas	5	1	2	1 1	0	0	1
California	8	1	0	1-c-1	0	0	1
Colorado	19	1	1	1-c-1	0	480	0
Connecticut	Indef.	1	1	1 1	0	0	1
Delaware	9	1	1	1-c-1	0	0	1
Florida	3	1	2	1 0	0	600	0
Georgia	13	1	1	1-c-1	0	25	0
Idaho	3	1	1	1-c-1	0	600	0
Illinois	5	1	1	1-c-1	6750	0	0
Indiana	5	2	0	1 0	6000	0	0
Iowa	3	1	0	1 0	0	4000	0
Kansas	6	1	1	1 1	*	0	0
Kentucky	3	1	1	1-c-1	0	(3)	0
Louisiana	5	1	1	1-c-1	0	0	1
Maine	5	1	1	1-c-1	0	0	1
Maryland	8	1	1	1 1	7200	0	0
Massachusetts	5	1	0	1-c-1	0	600	0
Michigan	11	1	1	1-c-1	4000	0	0
Minnesota	5	1	1	1-c-1	1800	0	0
Mississippi	5	1	0	1-c-1	0	360	0
Missouri	6	1	1	1-c-1	0	400	0
Montana	5	1	1	1-c-1	0	100	0
Nebraska	6	1	1	1-c-1	0	**	0
New Hampshire	5	1	0	1-c-1	0	0	1
New York	19	1	1	1 1	(6)		
New Jersey	9	1	1	1 1	1500	0	0
New Mexico	8	1	6	1-c-1	0	0	1
North Carolina	15	1	1	1-c-1	*	0	0
North Dakota	5	1	1	1-c-1	0	500	0
Ohio	6	1	0	1 1	6000	0	0
Oklahoma	7	1	1	1 1	2400	0	0
Oregon	3	1	1	1-c-1	(6)		

* Paid by state board of education. Amount not given.
** Amount not given.
(3) Half of fees collected.
(4) Secretary and treasurer office filled by one person.
(5) Median of board membership is six.
(6) Nothing given.

	Number Members	President	Vice-President	Secretary Treasurer	Secretary Paid Full Time	Secretary Paid Part Time	Secretary Non-paid
Pennsylvania	9	1	1	1 1	0	0	1
Rhode Island	5	1	0	1-c-1	0	0	1
South Carolina	14	1	10	1-c-1	0	300	0
South Dakota	3	1	1	1-c-1	0	900	0
Tennessee	7	1	3	1-c-1	0	0	1
Texas	8	1	0	1-c-1	3000	0	0
Utah	21	1	1	1-c-1	0	0	1
Vermont	6	1	1	1-c-1	(6)		
Virginia	8	1	1	1-c-1	2800	0	0
Washington	5	1	1	1-c-1	(6)		
West Virginia	Indef.	1	1	1-c-1(4)	0	500	0
Wisconsin	5	1	0	1 0	0	3000	0
Wyoming	5(5)	1	1	1 1	0	0	1

The annual salaries of the full time secretaries vary from a minimum of $1500.00 to a maximum of $7200.00. The median salary is $3500.00. The average salary is $4145.00.

The officers of the boards of control, as shown in Table 3, are presidents, vice-presidents, secretaries, treasurers and a combination of secretary-treasurer posts.

1. The president is elected annually and in some cases semi-annually by either the members of the boards of control or by legislative assembly. The legislative assembly is an organized body whose members are chosen from the districts of the state. He presides at the sessions of the boards of control and at the general assembly sessions; is in some instances member ex-officio of annual committees; has power to interpret the rules and regulations and make decisions for member schools.

2. Vice presidents, from one to ten, were chosen in each association to act in place of the presidents when they are absent.

3. Ten states have full time salaried secretaries. They are usually elected for a period from three to five years and may be removed for cause.

The duties of the secretary of Illinois are to submit questions for discussion by mail, but no vote shall be taken except at the regular called meetings of the Association; to furnish the members of this Association from time to time with an official list of all the schools belonging to this Association; shall pay out money from funds belonging to the Association in the payment of bills only upon the order of the President; shall make a complete financial statement to the Association at the Annual Meeting; and he shall furnish bond in the amount of five thousand dollars ($5,000.00), premium on which shall be paid by the Association.

(4) Secretary and treasurer office filled by one person.
(5) Median of board membership is six.
(6) Nothing given.

Ohio has a Commissioner who fills the position as secretary. His duties are to maintain an office in Columbus; he shall be the executive head of the Association, and secretary of the Board of Control. He shall take the initiative in enforcing the rules and promoting the aims and interests of the organization. He shall decide all questions of eligibility and interpretation of rules, and shall impose and enforce penalties. The Board of Control, through its own initiative, or upon appeal made under regulations which it may prescribe, may amend or set aside the actions of the Commissioner. With the approval of the Board of Control, the Commissioner shall prepare blanks for the use of the schools, distribute reports and bulletins, and arrange and conduct tournaments and other athletic contests. He shall collect all dues and receipts from athletic events and deposit them with the Treasurer.

Oklahoma.—The secretary shall keep a record of all association meetings. He shall furnish to members of the association, on request, printed matter as follows: copies of the constitution and rules, blank contracts, forms for contests, forms for principals to use in certifying contestants. He shall distribute between October 1 and October 15 of each year lists of the members of the Association. He shall give opinions regarding eligibility whenever required.

Indiana.—The secretary shall have charge of the property and records of the Association; shall receive all money for dues and the sale of publications of the Association; shall issue all circulars authorized by the Board of Control; shall attend meetings of the Board when requested to do so by the Board; shall turn over to the Treasurer of the Board all money in his possession when called upon to do so; shall perform such other duties as the growth of the Association, as determined by the Board, may require; it shall be his duty to publish I.H.S.A.A. Handbook immediately following the Annual Meeting of the Association.

Maryland.—The secretary shall attend all meetings of the Executive Committee; shall keep a record of the proceedings of the Executive Committee and shall perform such other duties as the Executive Committee may from time to time assign to him.

Michigan, Minnesota, New Jersey, Texas and Virginia do not state the duties of their secretaries.

4. The Treasurer is elected from the personnel of the Board. His duties are those that usually devolve upon such an officer.

Duties and Powers of Board of Control

Thirty-eight states give their boards of control blanket authority to run their associations.

In Indiana the Board of Control shall have general control over all athletic contests between and among the members of this Associ-

ation. It shall have exclusive control of the annual interscholastic tourneys and meets. It shall determine forfeitures, as provided for in these rules. It shall give interpretations of the rules of this association. It may at the end of the athletic season and at its discretion issue a statement of its official opinion as to the relative standing of the teams. When charges are made in writing by a member of the Association against another member for violation of these rules, the Board of Control, after giving due notice of the time and place for the school so charged to be heard, shall consider such charges and may suspend the offending school for a period not exceeding one year. The Board of Control shall decide all protests brought before it with reference to qualifications of contestants in meets and tourneys. When any matter comes before the Board for decision which is of special interest to a school of which a member of the Board is a representative, the remaining members of the Board shall appoint another person to act in his place in the matter.

Summary

1. The median membership of the Boards of Control is six.
2. The officers of these Boards are president, vice-president, secretary, treasurer and a combination officer secretary-treasurer.
3. The duties of these officers are those usually devolving upon such officers in corporations.
4. The duties of these Boards of Control are similar to those of directors of large corporations.

Part III

Rules and Regulations of State Associations

Of all the rules that were found to be in force by the different associations, only eight have a frequency greater than twenty-four. In Table 4 these rules have been tabulated.

Inter-School Report

The rule demanding that principals interchange reports at least five days before contests was found, in very similar forms, in forty-eight states. This report contained the name, age, subjects passed current semester, number of years participated, subjects passed preceding semester, report of physical examination of participant (if it is required) and other data to show the exact status of each student.

Annual Report

The annual report to the secretary contains all information on the inter-school report and also gives the number of sports each student took part in. This report is used as a permanent athletic record.

TABLE 4

RULES AND REGULATIONS OF STATE ASSOCIATIONS

	Inter-school Report Before Game	Annual Report to Secretary	Play Only Association Team	Physical Examination Players	No Award Value over $1.00	Official Contract for Games	Association Meets Annually	Coaches Hired Full Time	Controls All Athletics	Pre-season Practice Barred
Alabama	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Arizona	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Arkansas	No	No	Yes	No	No	Yes	No	No	Yes	No
California	Yes	No	Yes	No	No	No	No	No	Yes	No
Colorado	Yes	No	No	No	No	No	Yes	No	No	No
Connecticut	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	No
Delaware	Yes	Yes	Yes	No	No	No	Yes	*No	Yes	No
Florida	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No
Georgia	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No
Idaho	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Illinois	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indiana	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Iowa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Kansas	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No
Kentucky	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Louisiana	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Maine	Yes	No	No	No	No	Yes	Yes	No	Yes	No
Maryland	Yes	No	No	Yes	No	No	Yes	No	Yes	No
Massachusetts	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes
Michigan	Yes	No	No	Yes	Yes	Yes	Yes	*No	Yes	Yes
Minnesota	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Mississippi	Yes	No	No	No	No	Yes	Yes	Yes	Yes	No
Missouri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Montana	Yes	Yes	Yes	No	(1)	Yes	Yes	Yes	Yes	No
Nebraska	Yes	Yes	Yes	No	(2)	Yes	Yes	Yes	Yes	No
New Hampshire	Yes	No	No	No	No	No	No	No	No	No
New York	Yes	Yes	No	Yes	(2)	No	Yes	Yes	Yes	No
New Jersey	No	Yes	No	No	No	No	Yes	No	Yes	No
New Mexico	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
North Carolina	Yes	Yes	No	Yes	No	No	Yes	No	Yes	No
North Dakota	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Ohio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oklahoma	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes
Oregon	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Pennsylvania	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Rhode Island	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No
South Carolina	No	Yes	Yes	Yes	No	No	Yes	No	Yes	No
South Dakota	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tennessee	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Texas	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Utah	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Vermont	Yes	No	Yes	No	No	No	No	No	No	No
Virginia	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Washington	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No
West Virginia	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Wisconsin	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wyoming	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No
Total	44	27	29	24	22	36	41	29	44	13
Per cent	93.6	57.4	61.7	51.0	46.8	76.6	87.2	61.7	93.6	29.8

*Outside coaches are used but have no voice in controlling athletics.
(1) $3.00.
(2) No set price.

Rule of Competition

The rule requires that schools play only association teams. This is for the purpose of getting all schools under administrative control, and tends to promote better organization of athletics.

Making Awards

No award given with value over one dollar has been adopted by twenty-two states. This rule helps to keep the games purely amateur.

Physical examination of players should be demanded in all schools. Twenty-four states require this to be done before participation.

Official contracts for games lead to a more businesslike procedure and are used in settling any disputes that may arise.

Annual Meetings

Forty-one state associations meet annually. These meetings are used to improve the rules and regulations, to develop a broader program of physical education, elect officers and boards of control, audit the books of the secretary, give an annual report, to suspend and reinstate those schools that have broken the rules and regulations.

Employment of Coaches

Coaches are employed as full time members of the faculty in twenty-nine states. Experience has shown that a better control of athletics can be obtained through this procedure. Delaware and Michigan allow outside coaches to assist in the coaching but they have no voice in the control of athletics.

Forty-four states have control over all athletics. Perhaps the other four states will be in full control at an early date. Thirteen states regulate against pre-season practice for athletic teams. In the states where this is not demanded some schools have an unfair advantage over the other schools.

Penalties for Rule Violations

Principals and superintendents are not allowed the plea of ignorance on rule violations. For violating association rules the usual penalty is suspension from the association for a period of one year. Texas sometimes suspends for a period of three years. For using a player that is ineligible suspension for a year and forfeiture of all games won in which ineligible player was used is customary.

Forty-one state associations suspended the schools for rule violations. Thirty-one stated that games, where ineligible men were used, were forfeited.

TABLE 5

PENALTY FOR RULE VIOLATIONS

	Suspension	Forfeit Games		Suspension	Forfeit Games
Alabama	Yes	Yes	Missouri	Yes	Yes
Arizona	Yes	No	Montana	Yes	Yes
Arkansas	Yes	Yes	Nebraska	Yes	No
California	Yes	Yes	New Hampshire	No	No
Colorado	Yes	No	New York	Yes	Yes
Connecticut	Yes	Yes	New Jersey	No	No
Delaware	Yes	Yes	New Mexico	Yes	No
Florida	Yes	No	North Carolina	Yes	Yes
Georgia	Yes	No	North Dakota	Yes	Yes
Idaho	Yes	Yes	Ohio	Yes	Yes
Illinois	Yes	No	Oklahoma	Yes	No
Indiana	Yes	Yes	Oregon	Yes	Yes
Iowa	Yes	Yes	Pennsylvania	Yes	Yes
Kansas	No	No	Rhode Island	Yes	Yes
Kentucky	Yes	Yes	South Carolina	Yes	Yes
Louisiana	Yes	Yes	South Dakota	Yes	Yes
Maine	No	Yes	Tennessee	Yes	Yes
Maryland	Yes	No	Texas	Yes	Yes
Massachusetts	Yes	Yes	Utah	Yes	Yes
Michigan	Yes	No	Vermont	No	No
Minnesota	Yes	Yes	Virginia	No	No
Mississippi	Yes	No	Washington	Yes	Yes

SUMMARY

1. 93.6 per cent of states adopted the inter-school report before games.

2. 57.4 per cent of states have adopted the annual report to state secretary.

3. 61.7 per cent of states play only association teams.

4. 51.0 per cent of states require physical examinations of players.

5. 46.8 per cent of states make no awards to players which have a value of more than one dollar.

6. 76.6 per cent of states use official contracts for games.

7. 87.2 per cent of states have annual meetings in their associations.

8. 61.7 per cent of states employ full time coaches.

9. 93.6 per cent of states control all athletics.

10. 29.8 per cent of states prohibit pre-season practice for teams.

Part IV

Rules and Regulations Pertaining to Athletics

The most common rule found pertaining to the athlete stated that he must be an amateur. An amateur was defined as a student that had not used his athletic skills for gain financially, had not played for money, had not competed for prizes, had not played with professionals on the same team, had not bet on the game, had played

TABLE 6

RULES AND REGULATIONS PERTAINING TO ATHLETES

	Ineligible After 8 Semesters	Passing in Work Preceding Semester	Passing in Work Current Semester	Competing Age Under 21	Competing Age Under 20	Play Four Years any Sport	Suspension for Profanity, Tobacco, Intoxicants	Migratory Rule	Entrance Date Limit	Participate 1 Game Counts Season	Amateurs Only Can Compete
Alabama	No	Yes	Yes	Yes	No	Yes	No	Yes	20 da.	Yes	Yes
Arizona	Yes	Yes	Yes	Yes	No	Yes	No	Yes	16 da.	No	Yes
Arkansas	**No	Yes	Yes	Yes	No	Yes	No	Yes	10 da.	No	Yes
California	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes
Colorado	9 Yes	Yes	Yes	Yes	No	Yes	No	No	16 da.	Yes	Yes
Connecticut	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
Delaware	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes
Florida	No	Yes	Yes	Yes	No	11	No	Yes	10 da.	No	Yes
Georgia	No	No	Yes	No	Yes	Yes	No	Yes	20 da.	No	Yes
Idaho	Yes	Yes	Yes	Yes	No	Yes	No	Yes	11 da.	No	Yes
Illinois	No	Yes	Yes	Yes	No	Yes	No	Yes	11 da.	No	Yes
Indiana	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
Iowa	Yes	Yes	Yes	Yes	No	Yes	No	Yes	10 da.	Yes	Yes
Kansas	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	15 da.	No	Yes
Kentucky	****Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	20 da.	Yes	Yes
Louisiana	No	Yes	Yes	Yes	No	Yes(4)	No	Yes	11 da.	Yes	Yes
Maine	No	Yes	Yes	Yes	No	Yes	No	Yes	15 da.	Yes	Yes
Maryland	No	No	No	Yes	No	Yes	No	No	No	No	Yes
Massachusetts	No	Yes	Yes	No	Yes	No Limit	No	Yes	No	No	Yes
Michigan	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes
Minnesota	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Indef.	Yes	Yes
Mississippi	No(9)	Yes	Yes	Yes	No	Yes(4)	No	Yes	Oct. 5	No	Yes
Missouri	(3)Yes	Yes	Yes	Yes	No	Yes	No	Yes	11 da.	No	Yes
Montana	Yes	Yes	Yes	Yes	No	Yes	No	Yes	11 da.	No	Yes
Nebraska	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes
New Hampshire	No	Yes	Yes	Yes	No	Yes	No	Yes	15 da.	No	Yes
New Jersey	No	Yes(2)	Yes(2)	Yes	No	Yes	No	Yes	No	No	Yes
New Mexico	No	Yes	Yes	Yes	No	Yes(5)	No	Yes	16 da.	No	Yes
North Carolina	No	Yes	Yes	Yes(5)	No	Yes	No	Yes	No	No	Yes
North Dakota	Yes	Yes	Yes	Yes	No	Yes(4)	Yes	Yes	No	No	Yes
Ohio	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes
Oklahoma	Yes	Yes	Yes	Yes	No	Yes	No	Yes	10 da.	Yes	Yes
Oregon	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Pennsylvania	Yes	Yes	Yes	Yes	No	Yes	No	Yes	20 da.	Yes	Yes
Rhode Island	No	Yes	Yes	Yes	No	Yes	No	Yes	No	***2	Yes
South Carolina	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
South Dakota	Yes	Yes	Yes	Yes	No	Yes	No	Yes	16 da.	Yes	Yes
Tennessee	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	20 da.	Yes	Yes
Texas	No	Yes	Yes	No	Yes	Yes	No	Yes	6 da.	No	Yes
Utah	Yes	Yes	Yes	No	Yes	Yes	No	No	20 da.	Yes	Yes
Vermont	No	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes
Virginia	No	No	Yes	Yes	No	Yes	No	Yes	No	No	Yes
Washington	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
West Virginia	Yes(10)	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes
Wisconsin	Yes	Yes	Yes	No	Yes	Yes	No	Yes	15 da.	Yes	Yes
Wyoming	Yes	Yes	Yes	Yes	No	Yes	No	Yes	15 da.	Yes	Yes
Totals	79	42	45	37	10	41	7	42	26	20	47
Per cent	40.4	89.3	95.7	78.7	21.2	87.2	14.9	89.3	55.3	42.5	100

*The "Yes" in these columns signify that the rule is in force in these states.
**"No" means that the rule is not in force.
***Must take part in two games.
****Ten semesters.

(1) Same as years in high school.
(2) Left to school.
(3) Nine semesters.
(4) Play 5 years—one year played in grades.
(5) Must not be 21 before September 1 to play that semester.

just for the love of the game and for the physical development involved.

This rule is in force in all the states studied. Eleven rules are included in Table 6. It is interesting to note that thirty-seven states have the age limit set at twenty-one years, while the National Federation has the twenty year limit and has a membership of thirty-one states.

Attendance Rules

The eight semester attendance rule has been adopted by nineteen states; two adopted the nine semester rule; and two adopted the ten semester rule. This rule makes students ineligible for competition after having been in attendance for the above named semesters. In most cases twenty days' attendance in any semester counted as one semester's attendance. This rule prevents older students from loafing in order that they may be eligible for more competition.

Scholastic Requirements

In forty-two states it is required that students pass in at least three subjects, which will allow one and a half units under the Carnegie Foundation definition of registration, out of four for the preceding semester.

Forty-five states demand the same scholastic requirements for the current semester. New Jersey leaves the scholastic requirement up to the individual school heads.

Age Limit

Thirty-seven states have the age limit for competition set at twenty-one, while ten states have the limit at twenty.

Tobacco, Profanity, Intoxicants

Seven states suspend students who use tobacco, profanity or intoxicants during the period of athletic competition.

Migratory Rules

Forty-two states enforce the migratory rule. This means that no student may transfer from a regular school to one of the same class without serving a semester or two semesters, and be eligible immediately. Exceptions are made where families move from one district to another, provided no inducements have been offered the parents to move.

Time Limit for Entrance

Twenty-six states have set a date beyond which no student may enter and be eligible for athletics.

Personal Participation

Twenty states rule that playing in one game shall be counted as a season in that sport.

Summary

1. Nineteen states rule students ineligible after eight semesters' attendance; two after nine semesters' attendance; and two after ten semesters' attendance.
2. 89.3 per cent of the states demand that students pass three out of four subjects taken the preceeding semester to be eligible.
3. 95.7 per cent of the states demand the same scholarship during the competing semester.
4. 78.7 per cent of the states have the age limit at twenty-one years.
5. 21.2 per cent of the states have the age limit at twenty years.
6. 87.2 per cent of the states allow four years' competition in any sport.
7. 14.9 per cent of the states rule students ineligible for competition when guilty of using tobacco, profanity and intoxicants.
8. 89.3 per cent of the states enforce the migratory rule.
9. 55.3 per cent of the states have entrance dates set after which no students may enter school and be eligible.
10. 42.5 per cent of the states count participation in one game as a season in that sport.
11. 100 per cent of the states have the amateur rule.

Part V

Sports in Which Championships Are Declared

Championships in eight different sports are declared in the different states. The four major sports, football, basketball, baseball and track and field are the most frequently declared. Basketball is the leading sport among the states. Thirty-eight states declare championships in this sport and no doubt some of the other ten do likewise but available material for this study did not state.

Only two states declare championships in skating.

Table 7 gives all the information on the championships.

In football only sixteen states declared championships. Three states declared district and league championships. Nevada declares state championship according to a questionnaire received by secretary of Iowa Athletic Association. Published in Bulletin No. 34, 2/1928. In basketball thirty-eight states declare championships. All of these states use the tournaments except North Carolina. In North Carolina divisional winners are decided by elimination and the final game is played at Chapel Hill to decide the winner. In baseball eighteen

TABLE 7

CHAMPIONSHIPS DECLARED

	Foot-ball	Basket-ball	Base-ball	Track Field	Ten-nis	Swim-ming	Golf	Skat-ing
Alabama	No	No	No	No	No	No	No	No
Arizona	No	Yes	Yes	Yes	No	No	No	No
Arkansas	No	Yes	No	Yes	*	No	No	No
California	**Yes	Yes	Yes	Yes	Yes	No	No	No
Colorado	Yes	Yes	Yes	Yes	Yes	No	No	No
Connecticut	No	No	No	No	No	No	No	No
Delaware	Yes	Yes	Yes	Yes	Yes	No	No	No
Florida	Yes	Yes	Yes	Yes	Yes	No	No	No
Georgia	No	Yes	No	Yes	No	No	No	No
Idaho	Yes	Yes	Yes	Yes	Yes	No	No	No
Illinois	No	Yes	No	Yes	Yes	No	No	No
Indiana	No	Yes	No	Yes	No	No	No	No
Iowa	No	Yes	No	Yes	No	No	Yes	No
Kansas	No	Yes	No	Yes	No	No	No	No
Kentucky	No	Yes	No	Yes	No	No	No	No
Louisiana	Yes	Yes	Yes	Yes	Yes	No	No	No
Maine	No	Yes	No	No	No	No	No	No
Maryland	No	Yes	No	Yes	No	Yes	No	No
Massachusetts	No	No	No	No	No	No	No	No
Michigan	No	Yes	No	Yes	Yes	Yes	Yes	No
Minnesota	No	Yes	No	Yes	No	No	No	No
Mississippi	Yes	Yes	Yes	Yes	Yes	No	No	No
Missouri	No	Yes	No	Yes	No	No	No	No
Montana	Yes	Yes	No	Yes	No	No	No	No
Nebraska	No	No	No	No	No	No	No	No
New Hampshire	No	No	No	No	No	No	No	No
New York	No	Yes	No	Yes	Yes	Yes	Yes	Yes
New Jersey	Yes	No	No	No	No	No	No	No
New Mexico	No	Yes	No	No	No	No	No	No
North Carolina	Yes	Yes	Yes	Yes	Yes	No	No	No
North Dakota	No	Yes	No	Yes	Yes	No	No	No
Ohio	No	Yes	Yes	Yes	Yes	Yes	No	No
Oklahoma	(2)	Yes	No	Yes	No	No	No	No
Oregon	No	Yes	No	No	No	No	No	No
Pennsylvania	No	Yes	Yes	Yes	No	No	No	No
Rhode Island	No	No	Yes	No	No	No	No	No
South Carolina	Yes	Yes	Yes	Yes	No	No	No	No
South Dakota	No	Yes	No	Yes	No	No	No	No
Tennessee	No	Yes	Yes	Yes	No	No	No	No
Texas	Yes	Yes	Yes	Yes	Yes	No	No	No
Utah	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Vermont	No	No	No	No	No	No	No	No
Virginia	Yes	Yes	Yes	Yes	Yes	No	No	No
Washington	No	Yes	No	No	No	No	No	No
West Virginia	Yes	Yes	No	Yes	No	No	No	No
Wisconsin	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wyoming	No	Yes	No	No	No	No	No	No
Total	15	38	18	33	18	6	5	2
Per Cent	31.9	80.8	38.3	70.1	38.3	12.7	10.6	4.2

states decided the championship. The method of deciding was not stated in all cases but some used tournaments and others used district methods to find the best teams; then through a final game determined the winners. In track and field thirty-three states used state meets to determine the winner. In tennis eighteen states held

tournaments to decide the champions. Six states have swimming and five states have golf meets to select the winners. Two states, New York and Wisconsin, determined the champions in skating by holding state meets. No unofficial tournaments are held in any states for determining championships in any sports by outside agencies, according to information given in this study.

Summary

1. 31.9 per cent of the states declare state championships in football.
2. 80.8 per cent of the states declare state championships in basketball.
3. 38.3 per cent of the states declare state championships in baseball.
4. 70.1 per cent of the states declare state championships in track and field.
5. 38.3 per cent of the states declare state championships in tennis.
6. 12.7 per cent of the states declare state championships in swimming.
7. 10.6 per cent of the states declare state championships in golf.
8. 4.2 per cent of the states declare state championships in skating.

Part VI

Successful State Associations

Indiana

In September, 1925, by a referendum vote, the High School Principals passed a legislative body proposal calling for four members from each of the five (5) I.H.S.A.A. districts. The five members of the Board of Control and the fifteen other members elected by the Principals in a mail vote constitute this legislative body. Prior to this scheme all legislation was done at the annual meeting or by referendum voting by mail. This Legislative Body of twenty members passes on all proposals submitted by the High School Principals. It is the law making body of the Association. The scheme is considered a step in advance in state administration and legislation in athletic activities.

The primary purpose of the organizers of the I.H.S.A.A., to manage and to foster high school athletics on a high plane, has been held up as an ideal by the Association through the twenty years of the life of the I.H.S.A.A. New and advanced steps have been taken whenever conditions made them necessary. It became increasingly evident as time went on that the I.H.S.A.A. should assume a larger and larger initiative in real physical education for all boys and all

girls, and that physical education should be interpreted in the light of other educational aims and ideals. Accordingly, the I.H.S.A.A. now has a program, not only for the managing and fostering of high school athletics, but for the stimulation of communities and schools to the end that real physical education be given all boys and all girls throughout the grades and the high school.

Indiana's Association is very highly organized. It has a membership of 798 schools. Few schools of the state stay out of the Association. At the state basketball tournament in Indiana great crowds follow the teams in action. The receipts for the games reach approximately twenty-four thousand five hundred dollars. The state schools perhaps have the best facilities for basketball in the United States.

Texas

The Texas Interscholastic League is the most highly organized and has the largest membership (4492 schools) of any similar organization in the United States. Its purpose is to organize and direct, through the medium of properly supervised and controlled contests, desirable school activities, and thereby assist in preparing pupils for citizenship.

The Texas organization was founded in 1910 and it is of the combined literary and athletic type. The entire school year is filled with activities that are of vital interest to all schools in the state.

Michigan

In this association it has been found that the authority vested in the director by virtue of being a state officer has, at certain times, been invaluable. On the other hand, the arrangement whereby legislative and executive direction has been delegated to elected representatives of the schools has proved very effective, and apparently very satisfactory.

Not the least of the contributions of the last two years has been the formulation and widespread consideration of standards of good sportsmanship from the standpoint of various groups having to do with athletics. These have been widely distributed among other states and really mark the most advanced step taken anywhere along these lines. These standards were formulated under the inspiration of the state director of interscholastic athletics, Mr. Thompson, by committees appointed by the president during the summer of 1925. The association is under lasting obligation to many different individuals for important contributions to these standards.

The standards combined with other influences centering in the publicity procedures of the association have done much to advance the character of sportsmanship throughout the state. This, in fact, is the preeminent accomplishment of the association. Today, as

never before, schools are ashamed of evidences of poor sportsmanship and constantly strive to improve conditions along these lines. Not only is this true, but it is also true that accurate knowledge of rules is more widespread than ever before.

There have been decided changes in the athletic events. Basketball has been greatly modified. In place of regional tournaments held at the normal schools, both district and regional tournaments are held. By this means the weaker teams are eliminated from competition in the state meet and the meets can be conducted with less danger to the physical welfare of the participants and less expense to the competing schools.

Similar improvements have been made in other branches of athletics.

Illinois

The constitution and by-laws of the State Association of Illinois is one of the best in the United States.

The manager of this state association is, with one exception, the highest paid official connected with the state athletic associations. This manager has two very capable assistants.

The efficiency of these state organizations seems to be directly proportional to the salaries paid for management. In all cases the highly paid managers or directors are connected with efficient associations.

Iowa

The Iowa Association, aside from having a well organized and efficient organization similar to the above named states, has an approved list for officials who work in the major sports. Furthermore, a demand is made that the schools use an official contract with all officials obtained. A request is made that unless an official has a card showing that he is on the approved list he should not be used. Clean sports demand clean, honest officials. Only by this or a similar method can a check be kept on good and bad officials. The latter are dropped from the list and are not used.

Ohio

Among the many good things found in the Ohio Association was that of fostering Basketball Conferences for coaches and officials. The Conferences were arranged by the Ohio State University and an interpretation of rules and a game of basketball showing offensive and defensive strategy were shown. These meetings lead to a better understanding of the game and a cleaner sport is the result. Ohio has 1098 members in the association.

Summary

1. Outstanding and significant practices are carried on in Indiana, Texas, Michigan, Illinois, Iowa and Ohio.

Part VII

Criticisms and Comments

Forms of Constitutions and By-Laws

The constitutions and by-laws used for this study were received in the following forms: manual, twenty; handbook, twelve; pamphlet, eight; printed folder, six; special bulletin, one.

In the manual the information was found to be readily accessible. This was due to the fact that distinctive headings and double spacing with a size type that was very readable were used.

The handbooks were nicely arranged and presented all information in a thoroughly organized manner. Commendation is due both the Indiana and Michigan secretaries for their fine work.

The material in the pamphlets and printed folders was not in as good form as that used in the handbooks and manuals. However, most of these states do not spend as much money on their organizations as the ones mentioned above.

North Carolina puts out a special bulletin with different rules for different sports. They find it very successful in their type of organizations for it keeps the rules and regulations fresh in the minds of the school officials.

Omissions

There were several constitutions that omitted things that were of importance to persons not familiar with them. For instance:

1. Nebraska, Massachusetts, Illinois, Vermont and New Jersey failed to state if any championships were decided in the major sports.
2. Virginia, Vermont, New Jersey and Kansas failed to state the penalties for rule violations.
3. California, Kansas, North Carolina, South Carolina, New York and New Jersey failed to state that official contracts for games were used.
4. Florida, Maryland, New York, Texas, Vermont, Virginia and Washington failed to state the voting power in changing the constitution and by-laws.

Comments

These constitutions and by-laws are all of comparatively recent origin. Indiana is perhaps the oldest, and that is twenty-six years old.

Numbers of these states in forming their organizations have

merely copied parts of old organizations. One state gave Pennsylvania credit for what was adopted from her constitution. South Dakota seems to have used parts of the Wisconsin constitution.

It is very well that the young states profit from their older sisters' mistakes, but some study should be given to these older states and faulty legislation should be omitted entirely if proper progress is to be made in the newer organizations.

Too few states have adopted the compulsory physical examination for contestants. This shows that some states are not as conscious of the physical education problem as they should be.

Only twelve states have full time permanent secretaries. This is another mistake for "everybody's business is nobody's business." The states should have full time secretaries and put on an extensive physical educational program and let the position of secretary grow with the program.

Only seven states have a combination literary and athletic program. It seems that the problem of physical education should be more closely coordinated with the other problems in education.

An excellent set of "Standards and Practices of Athletic Administration" is found in the Yearbook of the Michigan High School Athletic Association. These discuss the ideal relationship of the superintendent, principal, business manager or athletic director, coach, official and athletes to the athletic program. Standards similar to these should be incorporated into all state high school athletic associations.

Florida has five good forms that are used as reports in the way of contracts, eligibility lists, eligibility record sheet for transfer students, eligibility record for removing deficiencies, and eligibility record sheet for non-resident pupils.

Iowa has two recommended forms for physician's certificate and official's contract.

Conclusion

It is the writer's opinion that each state should have an efficient, highly paid director, appointed for a period of at least three years, and free from all political control, to carry out the work of the association. He feels that it is very evident from the facts presented herein that if the desired progress is to be made in the development and control of high school athletics, such a director is necessary for the proper advancement to be made in the field of interscholastic athletics and physical education. He further concludes that a closer cooperation among the states, and a more standardized type of organization set up would bring about more efficient and adequate rules and regulations for the governing of the high school athlete.

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State Organizations of Athletic Associations for Girls in Secondary Schools*

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Introduction

THE purpose of this paper has been to determine whether or not there is a tendency toward state organization for high school girls' athletic associations in the United States, and to study the types, purposes, and plans of organization in the various states.

A survey of the published material on the subject revealed that a few states, such as Illinois and Oregon, have presented their plans of activity, and that special surveys, questionnaires, and committee studies of girls' athletics have been made in several of the states. Material on the history and organization of state athletic associations for girls in secondary schools is very limited. The *School Review* of December, 1928, with an article on "High School Athletic Associations," in a brief study of the development of athletic associations, furnished the only available survey of girls' state athletic associations for this paper. The article brought in organizations formed prior to 1926.

The main contribution to the study is found in the results of a questionnaire which was sent to each of the states in the Union, as follows:

QUESTIONNAIRE

I. Is there a state organization of high school athletic associations for girls in your state? .....

II. If not, has a representative group of Physical Educators considered such an organization, favorably or unfavorably?.....
Comments: .....

The following should be answered if a state organization exists:

III. a. Do you have a manual or constitution? Yes..... No.....
(A copy of either the manual or constitution will be most helpful in the present study.)
b. When was the organization formed? .....
c. Was it organized by the State Director of Physical Education?.....
..... the State University? .....

* Graduate study completed June, 1930, at the University of California, Berkeley.

d. Does the organization exist solely for girls? .....
e. Is it part of an organization including boys? .....
f. Approximately how many schools are members? .....
g. Approximately what is the total number of secondary schools in the state? .....
h. Does the organization tend to interest (attract) small, medium, large, or all types of schools? (*Underline*)

The following should be answered if the answer is not in the manual:

IV. a. What are the purposes of the organization:
1. To stimulate an interest in girls' athletics?.....
2. To standardize and promote ideals of health? .....
3. To further ideals of good sportsmanship? .....
4. .....
5. .....

b. What is the plan of the organization:
1. A point system? .....
2. .....

Signed.....

Title .....

This questionnaire was planned to discover the state organizations in existence, and, if there was no such organization, whether or not a representative group of physical educators of the state had considered the matter favorably or unfavorably. If the answer to the organization was in the negative, no further material was necessary. The states indicating organization were asked the date of formation, and which agent in the state had initiated the plan. Knowledge of a few state associations led to the inquiry as to whether the association existed solely for girls, or as a part of an organization including boys. The approximate number of school members of the organization in comparison with the total number of secondary schools in the state, seemed an indication of the representative character of the organization in the state. The questionnaire planned to seek out the size of school attracted by the activities and organization of the league or state organization. With a statement of three general purposes, and a statement of a plan of organization, it was felt that a state could readily classify its purposes and plans by checking those applying to itself. Space was left for a brief statement of any additional objectives or modes of carrying out its activities.

A large part of the material, aside from the questionnaire answers, was found in the manuals and constitutions of the various state athletic associations which accompanied the questionnaire returns.

Analysis of Material

A gratifyingly large number of replies to the questionnaire was received. Of the 48 states 41, or 85 per cent, returned the questionnaires.[1] In some instances, constitutions and handbooks outlining

[1] Material from the states which have not responded will be appreciated for the completion of this study.

the work within the state, were included, which greatly broadened the view of the state league or organization of girls' athletic associations within the state.

The replies varied from the statement of no state organization of girls' athletic associations to highly centralized state organizations for high school girls. The following summary indicates the types of organizations, and the number of states included in each grouping.

1. No state organization of G.A.A.'s.....20 states
2. State organization including boys and girls.....12 states
3. State organization including boys, but with an independent plan of activity for girls ..... 3 states
4. State organization existing solely for girls ..... 5 states
5. State organization of a point system for girls..... 1 state

This indicates some degree of state organization of girls' athletics in 21 states, and no organization in 20 states of the 41 replying.

1. In considering the replies, it seems probable that an unforeseen difference in the interpretation of the meaning of "state organization of athletic association for girls" has arisen. In certain instances, the reply has been in the negative, followed by the statement of an organization including boys and girls, but in other cases, where no explanation followed, it was impossible to determine whether or not the same interpretation has been placed upon the question.

2. The organization for girls in the various states, where girls and boys are under the same association, varies. A number of states point out that the same rules apply to girls as well as to boys, while others have introduced into their by-laws or other sections of their codes, recommendations or regulations, a brief statement concerning girls' interscholastic contests. To take basketball as an example, since it is the sport most commonly mentioned, several make the statement that girls' rules must be employed in interscholastic contests. However, the constitutional statements do not seem completely to indicate the situation of the girls' athletic activities in these various states. The "Report of the Advisory Committee on Athletics for High School Girls" in Pennsylvania points out the fact that the following states, which report the same organization for boys and girls, have taken definite steps against interscholastic competition for high school girls: South Dakota, Missouri, New Jersey, West Virginia, New York, California.

One of the recommendations of the committee for Pennsylvania is "that schools organize a program of intramural activities and look forward to restricting interscholastic competition for girls." The report quotes the vote of the National Association of Secondary School Principals at Cincinnati in 1925, "to throw the weight of our influence against interscholastic athletics among girls and women wherever possible, through the state athletic associations, to legislate

against such activities.[2] In its manual, Missouri recommends that interscholastic competition be abolished, and that women coaches have charge of this sport.

3. Three states with organizations which include boys and girls, have independent plans of organization for the two. In Illinois, where the girls' association is affiliated with the boys', the boys' association financially aids the girls' association, and the secretary and manager of the boys' organization are on the girls' executive committee. However, the girls have a separate constitution and manual of activities, and a woman manager of their affairs. Kansas has recently adopted a plan similar to that of Illinois. In Alabama, there is a special committee on girls' athletics with a woman advisor of athletics, and a separate handbook of girls' activities is issued by the state department of education.

4. Absolute independence is reported by a small number of states. Of these states 3 have plans similar to the state organizations of the states in the above section. One of the organizations is a basketball union, and the other offers more activities in interscholastic activities for girls.

5. In Oregon the plan of organization at present consists of a point system.

The Number of Schools Interested in State Organizations of G. A. A's.

The results of the questionnaire show that the states with independent organizations for girls' athletic associations have lower membership of schools than the states with the same plan for boys and girls. By referring to the map it will be seen that the states with the same plan of organization for boys and girls had their origins, almost entirely, during the first decade of the twentieth century, with a few scattered up to recent years; while the states with the special plans for girls' athletic associations have had their beginnings from the latter part of the second decade of this century with the majority coming into existence within the past ten years. This fact may account, to some extent, for the lower membership in the special-plan states. Within the states having the same plan for boys and girls, the regulation of interscholastic competition for boys was probably, up until fairly recently, the fact of primary importance. Since boys' interscholastic competition has been almost universally adopted by the schools of the various states of this country, it should be taken into account in a comparison of the two outstanding types of plans of state girls' athletic associations. It would be interesting to know when statements regarding the regulation of girls' activities were added to the regulations for boys in the states where the two are under the same organization. Scattered population, and sympathy

[2] Report of the Advisory Committee on Athletics for High School Girls. American Physical Education Review (April, 1928), p. 254-260.

with the ideals of the independent plan for girls on the part of instructors of physical education, may be influencing factors in the membership of the organization. The size of the school does not seem of significance in this matter. Fourteen of the sixteen reporting the size of school interested or attracted to the state organization, said that all different sized schools were interested. Schools with any degree of state organization of girls' athletic organizations were included in this statement.

Agent Initiating Plan

The initiation of the plans for state organizations has come from a state agent, a grouping of local units, or from the cooperation of the two. For example, in some cases the plan was reported to have been initiated by the state director of physical education, the state university or normal school, the state physical education association, or the state superintendent of schools, while in other instances it was initiated by interested coaches, principals, or independent agencies, the nature of which was not mentioned.

Purpose of Organization

There is a great similarity of purpose in the organizations of a number of the states. Those who have general plans including girls and boys give us as their purpose the promotion and governing of interscholastic contests in the high schools of the state, with emphasis upon good sportsmanship. Several states by their organizations aim to control, manage, or regulate the conditions under which interscholastic contests for girls exist. Certain standards of health were either implied by statement of aim or by other regulations governing activities, such as a part of the requirements for eligibility of players. The states with special plans of organization for girls are agreed that their purposes include the following points:

1. To stimulate an interest in girls' athletics.
2. To standardize and promote ideals of health.
3. To further ideals of good sportsmanship.

Some of these special organizations for girls also aim to encourage adequate programs of physical education for girls within the state, or to control the conditions under which girls' interscholastic contests occur. In the Oklahoma League of High School Girls' Athletic Association Constitution is found "all members shall endeavor to develop an adequate program of physical education."[3] That is followed by the statement of what an "adequate program" means. The constitution of the Colorado League includes in its purpose "the league shall aim to control the conditions under which interscholastic

[3] Constitution of the Oklahoma League of High School Girls' Athletic Associations, (1929).

contests are conducted."[4] This state organization also aims to develop an adequate program of physical education for girls within the state.

The following discussion deals with (1) the standards set, (2) the activities presented, and (3) the administration of the activities.

1. STANDARDS.

a. *Membership.* The state organizations with the same regulations for boys and girls, in most instances, state that all accredited high schools who are willing to comply with the rules of the organization, and pay the dues, are eligible for membership. However, in certain states, junior high schools are not eligible for membership. The state organizations affiliated with boys' organizations with separate plans for girls' activity, and those free from connection with boys' associations, are open to public, accredited high schools. Several states include junior as well as senior high schools, while others definitely state that the senior high schools only are eligible.

b. *Eligibility of participants.* Where there has been no enactment against or discouragement of interscholastic contests, girls are bound by the same eligibility rules as boys. Some of the rules most commonly found include standards of scholarship, age limitation, semesters of participation, residence, amateur standing, intrinsic value of trophies, management of teams, sanction of principal, health requirements. Among the states with special plans for girls, only three make provisions for interscholastic contests. One state constitution of girls' athletic association prohibits all interscholastic activity for girls, and another states that it will "in no way be instrumental in furthering interscholastic competition,"[5] but it aims "to control the conditions under which interscholastic contests are conducted."[6] Eligibility is not a problem in these state organizations, because of the absence of interscholastic competition. The emphasis is placed on activity under a point system, whereby pupils belonging to girls' athletic associations may, through activities in their home school, achieve certain recognition by meeting certain standards set by the state organization. The standards are set in scholarship, sportsmanship, games, posture, health, and health rules.

2. ACTIVITIES.

a. *Variety.* It was necessary in practically every instance to discover the activities included in the program where the one organization exists for boys and girls, by mention of activities made in the constitution or by-laws. In the majority of states basketball was the only activity mentioned. Some of these states apply boys' rules to girls' activities, while others require girls' rules for this sport. Inter-

[4] Colorado State League of High School Girls' Athletic Associations, Constitution and Point System, (1927), p. 6.
[5] Colorado State League of High School Girls' Athletic Associations, Constitution and Point System, (1927), p. 6.
[6] Ibid., p. 6.

scholastic contests in tennis are played in one state; another uses basketball and hockey as interscholastic sports. Contests in soccer football, tennis, volley ball and baseball are encouraged in a third state. States with point systems make detailed statements, and classification of their activities. It has been mentioned that the program of activities is planned to meet the need and interest of the pupil within his own school, so the plan of activities of the league center in and around the physical education program of the school. The activities are classified into directed activities, during and after school, and activities participated in outside of school without the supervision of the school physical director. Special tests in sports and other physical education activities, such as gymnastics and dancing, are a part of these programs as well as self-testing activities. A wide variety of sports, such as archery, baseball, basketball, bowling, golf, hockey, horseshoe pitching, rifle shooting, skating, soccer, swimming, tennis and volley ball, are recognized by the state organization. Some state organizations include the Athletic Badge tests, and the various tests offered by the American Red Cross. Medical and physical examinations, and health or training rules are also a part of these programs. Rules authorized by the Women's Division of the National Amateur Athletic Federation are followed in the various games. Some organizations of state girls' athletic associations award service and leadership in other school activities.

b. *Awards.* In states where the girls are under the same rules as boys, the awards are usually school letters, medals, and other trophies. Several states mention sweaters and jerseys, but set a limit to the monetary value which makes it almost impossible to use them as awards. Felt awards in the form of school and state emblems are used in the states with the independent plans for girls where the organization is under a point system. Pins, and jewelry, in a few instances, may be purchased extra. It is customary for the lower point value awards to be local letter awards, and the higher ones to be state emblem awards. The State Physical Education Bulletin of Missouri publishes a point system whereby boys and girls in high school may receive a state letter by fulfilling various requirements including a variety of athletic activities, gymnastics, folk dancing, games, service to the school in fields outside of athletics, and requirements of health, posture, scholarship, and sportsmanship. Juniors and seniors in high school are eligible. The plan is unique in that it offers its state letter to college students and to teachers.

Comments: A comparison of the variety of activities offered by the state organizations with the same and with special plans of activities for girls show a greater variety of activities offered through the organizations with independent plans for girls. Some members of both groups endeavor to keep the awards of as low intrinsic value

as possible. The majority of the independent-plan states place interest in the felt awards rather than in awards of greater value. The awarding of state letters may be of social value to the pupils in creating a recognition of membership in a larger unit than their local high school.

3. Administration

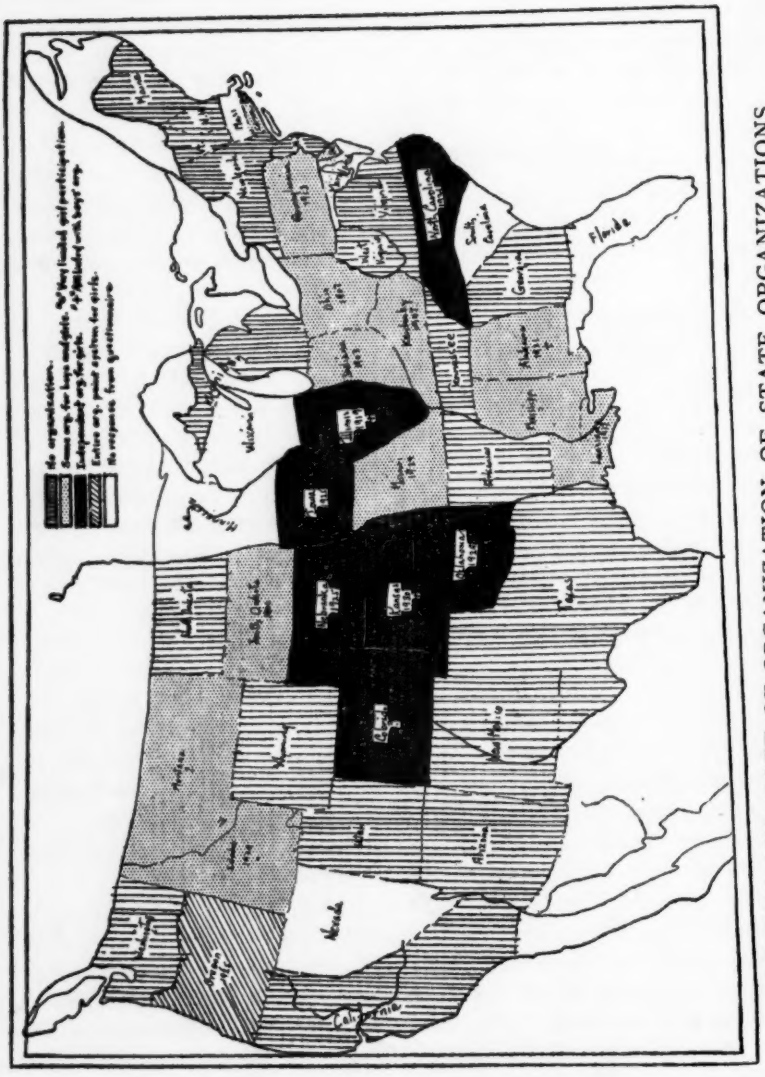
In considering the administration of activities in the various states, a similarity in organization was found. In general, the states with the same plan for boys and girls have a central board of control composed of faculty, principals, superintendents of schools, and in some cases, state directors of physical education, and representatives from the state board of education. Often members of this board represent the districts into which the state is divided for administrative purposes. The general meeting of the state organization is usually held at the time of the annual state high school teachers' meeting, and teachers or principals are the delegates from their respective schools. The board of control has general supervision of the organization. The regional or district groupings facilitate the administration of activities, and the immediate responsibility for the eligibility of the participants in the state organization activities is vested in the principals of the member schools. One member of the state board of control is appointed to carry on the correspondence with the members of the association. Two of the states which have special plans of state organization for high school girls' athletic associations, have developed their plans through special committees appointed by the state department of education. The remainder of the states are organized under an executive committee composed almost entirely of women physical directors of high schools. The manager of the boys' league is a member where there is an affiliation between the boys' and girls' associations. The director of women's physical education in the state university is included in some states. Only one state has high school students as members of the state executive committee. The general meeting of this type of organization occurs at the annual state teachers' conference or assembly. In several instances, the delegate from the local members is the director of girls' physical education, the principal, or another appointed faculty member, but in two states a student representative is included as well as an adult representative. One of the executive committee is ordinarily delegated to supervise the activities in the state organization. A full-time woman manager is employed in the Illinois League. The states which do not further interscholastic contests place the center of activity in the local girls' athletic associations. These local associations are under student officers with the advice of a school physical director of girls' activities or another faculty member.

All of the states indicating state organization of girls' athletic associations issue constitutions and by-laws for their members. The states with the same plan for boys and girls are, primarily, concerned with the eligibility of their members, while the states with special organizations include suggested standards for the organization of local associations, the classification of schools for the equalizing of points, detailed statement of point systems, and references to the material used in the plans to be formulated.

Interpretation, Summary and Conclusions

This study of the status of state organizations of athletic associations for girls in the secondary schools of the United States, brings out the fact that approximately half of the states have reported some type of state organization of girls' athletics. Of the 41 replying to the questionnaire 21 reported state organizations. The degree of organization varies from a brief statement of the same state organization for girls as for boys, to broad detailed plans quite independent of the boys' athletic association activities of the state. The former plans were, apparently, created for boys' athletics and applied to girls' athletics as the need arose. The group of eight states having special plans has, apparently, set out to build programs especially for the girls of the state. Certain of the states of each of these groups aim to control and regulate conditions existent in the state, but, as a whole, the states with the special plans for girls, have also offered broad activity programs, which tend to widen the physical education program of the secondary school, and to lay emphasis upon participation in a number of sports within the home school rather than in interscholastic activity. It has not been the purpose of this study to determine what effect a high degree of state organization of physical education has upon the presence or absence of a state organization of girls' athletic associations, but a glimpse at the history of state legislation on physical education shows that the states both with and without state organization of girls' athletic associations at the present time, had early legislation on physical education.

The map gives an indication as to the distribution of the various degrees of organization. The states without any organization for girls cluster on the well settled north Atlantic coast and among the sparsely settled western states, with a few scattered instances throughout the rest of the country. The states with the same organization for boys and girls are found in the middle area of the country from east to middle west. The states having special plans for girls form a nucleus in the west central section of the country. It is interesting to note that states of like organization tend to be grouped in couples or in larger groupings. This may account for the similarity of purpose in various states. Set off from the other states with special plans



DEGREE AND DATE OF ORGANIZATION OF STATE ORGANIZATIONS OF GIRLS' ATHLETIC ASSOCIATIONS

for girls are Alabama and North Carolina. Their handbooks indicate that they are more closely connected to their state departments of physical education than the other special plan state organizations. By referring to the dates of organization, it is found that the states with the same organization for boys and girls were the earliest to be formed, and that the states with special plans for girls have been organized almost entirely since 1920.

Although it would not be proper to conclude from this study that the tendency in the United States is towards centralized special plans of organization of girls' athletic associations in the states, the fact that the general sentiment is away from interscholastic competition for girls and that these special organization states aim to control girls' interscholastic contests as well as to develop broadened, adequate programs for all girls, might be a point in their favor. Since eight of these organizations have developed from 1919 on, and one more state expresses a probability that it will adopt such a plan in the near future, one would be led to believe that there is a growing interest in special plans for state organization of girls' athletic associations in the high schools of the various states of the Union.

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A Simple Pulse Recorder

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VARIOUS tests of physical fitness require the determination of the exact pulse rate immediately following a mild exercise. The accurate determination of this rate by palpation is, of course, impossible because of the difficulty of detecting and beginning the count of the pulsations of an artery as soon as the exercise ceases. To surmount this difficulty, and also to secure other advantages, the writers constructed a simple device for recording the pulse and measuring, according to a time scale, the interval between any two pulse waves. The pulse rate may be ascertained from this record at any time. Moreover, the same device, by slight modification, may be used as a very sensitive sphygmograph. For the most part the set-up requires the use of several pieces of standard apparatus, such as will be found in any physiology laboratory. The one special part, which supports the lever and the tambour, can be made by anyone, and at little cost. The one shown in Fig. I was cut out of a small piece of 7/8 inch board. The set-up requires no delicate adjustments, and can be operated by anyone. It remains in adjustment throughout the performance of a physical fitness test, and furnishes a continuous record except for the time of the actual exercise. The apparatus is here described in the belief that others will welcome its advantages, either as a pulse recorder or as a sphygmograph. It lends itself beautifully for use in elementary courses in physiology as a means of giving students an opportunity to investigate some of their own functional processes.

The apparatus, as assembled when in use, is shown in diagrammatic form in Figure I. An ordinary sphygmomanometer cuff is used, except that a friction joint and a stopcock are added to allow the bulb to be detached, on account of the disturbance its dangling causes while the exercise itself is being done. The tambour is made with a cylindrical thistle tube, filled with paraffin, through which a hole is bored. An ordinary dental rubber dam is stretched tightly over the top

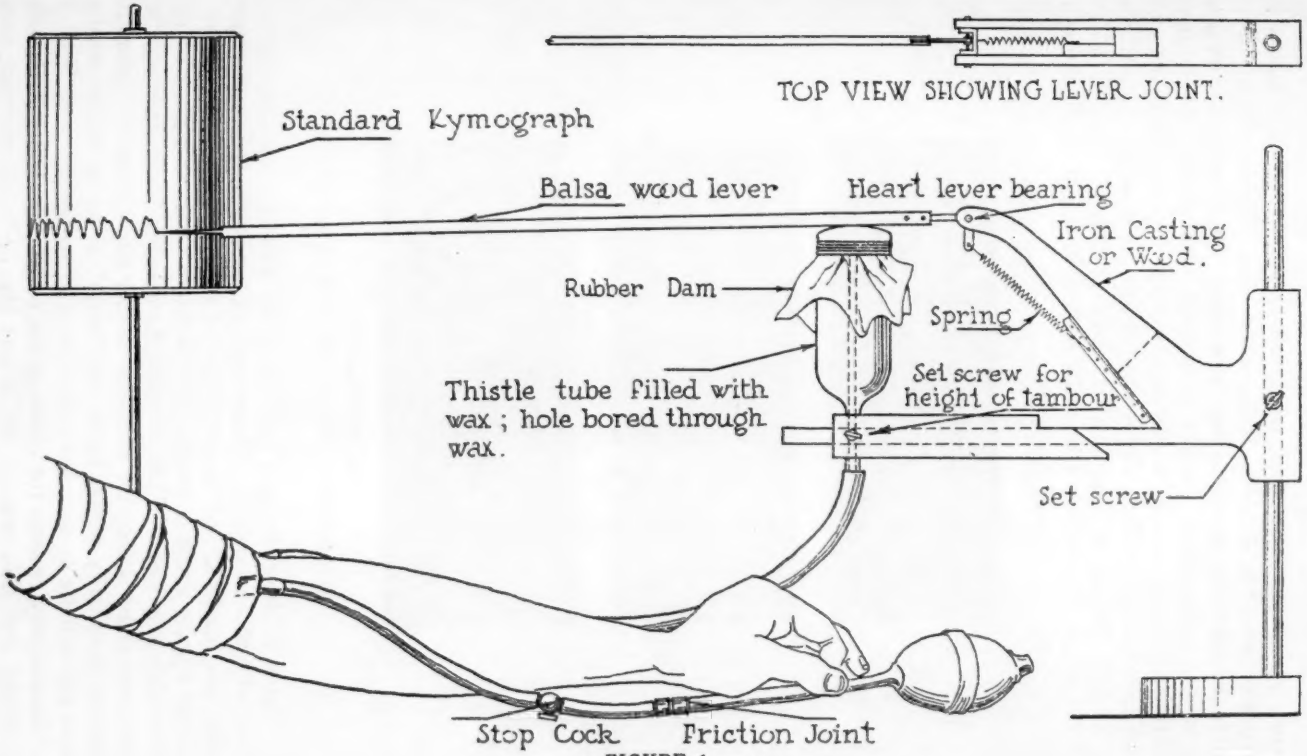
TOP VIEW SHOWING LEVER JOINT.
Standard Kymograph
Balsa wood lever
Heart lever bearing
Iron Casting or Wood.
Rubber Dam
Spring
Thistle tube filled with wax ; hole bored through wax.
Set screw for height of tambour
Set screw
Stop Cock
Friction Joint

FIGURE 1

of the thistle tube and secured with several rubber bands. Thistle tubes of various sizes were tried, but one that is 1 5/8 inches in diameter was found best. Balsa wood was adopted for the lever after several other materials had been tried. This wood is extremely light and quite rigid, thereby practically eliminating self-induced vibrations which metallic levers impose upon the tracing of the phenomenon being recorded. Balsa wood is kept in stock by many stores, to be sold for use in constructing model airplanes. Other features of the set-up are undoubtedly sufficiently clear from the diagram so as not to require further comment.

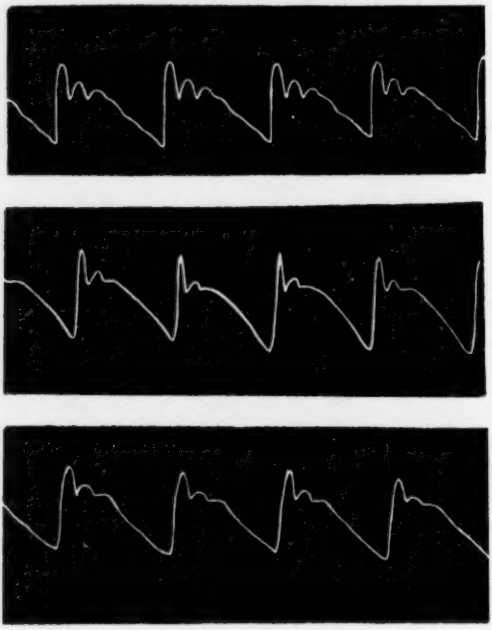

FIGURE II

Sphygmograms made from three different subjects.

Figure II shows various samples of the tracings (sphygmograms) made with this apparatus. These tracings are made without the time scale, but the latter, of course, may be easily added to the set-up. If only a pulse count is desired it is probably better to make tracings of smaller amplitude. This is easily done either by using a shorter lever arm or by sliding the tambour farther away from the fulcrum. Another possibility would be to use "stops" so as to permit only a small and definite up and down movement of the lever.

Satisfactory records for counting the pulse rate can be made with an almost negligible pressure of 20 mm Hg. or less in the cuff, and,

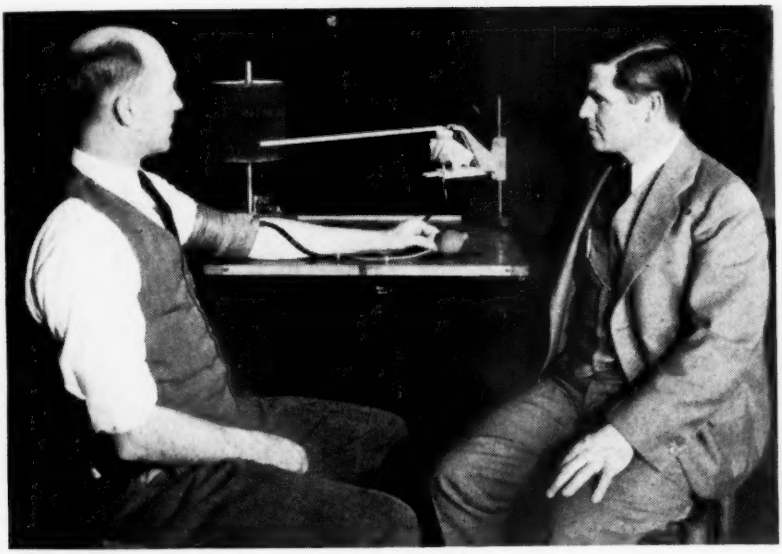

ILLUSTRATION I

The device in operation

therefore, causes little or no discomfort to the subject during the test, even though it may be more or less prolonged. Excellent sphygmograms may be made with a pressure of 50 mm Hg.

Since Marey's invention of the first sphygmograph in 1860, much interest has centered around the interpretation of pulse waves made by various forms of this apparatus. Two main principles underlie the methods employed in such recording. The one, as applied by Marey, recorded the oscillations of a long lever connected with a flat spring which lay over a pulsating artery. In the second, the oscillations were transmitted by air through a rubber tube to a tambour, which supported the lever. The device under discussion in this paper works on this same principle of air transmission.

If the records of the pulse are being made from the brachial artery of the arm, it is important that the arm rest in the extended position, as shown in the diagram.

Needed Research in the Field of Program in Physical Education

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THE limitations of this paper preclude any attempt to list even such researches in the field of program in physical education as are available in print. In addition to these many unpublished studies exist, largely Masters' theses, that are of real value. These are not available for study, however, and are known—where known—by title only. No attempt will be made, therefore, to discuss or evaluate any of these researches. It is hoped that, in a future publication, such studies may be grouped and discussed in a comprehensive way.

It is hard to separate research in the field of program from research in other fields of physical education; for much of all research in physical education focuses eventually on program. We have excluded from this field almost all research of the nature of pure science, even though it would contribute eventually to program. We would, however, include any study that directly contributes to program building or evaluation.

Most of the studies in physiology would be excluded from this field. The same would be true of studies of motor learning except in such cases where the motor learnings studied were themselves comparative programs. Tests and measurements have, in general, been considered as being outside the scope of this topic except where tests are devised or grouped and arranged for the specific purpose of furthering a general improvement in program rather than purely for scientific measurement.

We should like to state at this point the belief that *philosophical research* is a field which, particularly for program studies, must receive more general recognition and wider use. This type of research is denied a place in the family of tools of research by many scientists because of its lack of objectivity. Philosophical research is based fundamentally upon the process of accurate, logical, reflective thinking. A philosophy in a field like physical education is simply the taking into account of all of the scientific facts known, arranging them in their most logical, integrated order in all of the dimensions necessary, and then filling in the gaps between the known facts by

constructive thinking. The result is what has been called a "conclusion whole." It is a kind of integrated system of thought in a field of physical education. It can be used as a sort of basic hypothesis from which to depart into other forms of research.

Much experimental research involves the testing of hypotheses. We believe that much good might come in the field of program research from testing the hypotheses developed from adequate interrelated systems of philosophical thinking in this field. A philosophical hypothesis, of course, is simply the *most adequate* explanation the proposers of the hypothesis can offer. Its *validity* will depend upon how it stands the tests of experimentation.

To illustrate some of the needs for this kind of research, one has but to cite the problems revolving around objectives. Some objectives can be determined with a high degree of objectivity. Others, however, are primarily arbitrarily determined objectives of the teacher. Their validity will depend upon (*1*) the probability of their being subject to accomplishment as determined by what we know of the learning process; and (2) upon proof or lack of proof of the accomplishment of the objective in experimental situations. The desirability of some objectives will probably always remain based upon the criterion of subjective expert opinion.

It may be of service in the field of research in program to outline what the writer considers to be a logical division for research in this field.

General Program Research

1. The Individual. It would seem to the writer that too little has been written about the field of the ultimate consumer—the pupil—in the field of physical education. The formulation of objectives and of teaching procedure has been evolved primarily from the standpoint of teacher opinion. The pupil has far too often just been a statistic. We should suggest many more studies of individual pupil differences in motor ability, in motor capacity, in skills, in interests, in conditioning, all in the terms of North America in 1931. It would seem to us essential that, until we know how the individual feels about it all, we cannot safely proceed with many of the other phases of research in program, for they may be predicated upon false assumptions. A chain of reasoning is only as strong as its weakest syllogism. Much of this kind of study can be done by carefully prepared and analyzed questionnaires; but more work needs to be done in this field by individuals trained in psychological analysis and in interview techniques, who are capable of reaching behind superficial conditions to the deeper source of valid information. This kind of research is slow, and expensive of time and energy. How much easier it is to write a questionnaire!

2. Objectives. From reading the recent publications one might

think that our objectives have been well established. On the contrary, it would seem to the writer that as a profession we have hardly entered into an adequate study of objectives. We should like to suggest that it might be profitable to study objectives in the following way:

a) What objectives are significant to the pupil? These may be called *direct* objectives. They can be quite validly determined, and, from the standpoint of motivation, they are the most important ones for the teacher to know.

b) What objectives are of interest to the pupil because they help him to achieve his direct object and hence are relatively easy of motivation? These may be called *associate* objectives. For example, one direct objective of a boy may be to make of himself a skilled basketball player. In order to achieve this objective he may become interested in the regimen of training, otherwise known as personal hygiene. This problem of hygiene, if attacked from the viewpoint of associate objectives, may be more readily amenable of solution than if attacked as an end in itself. We are inclined to the belief that it is not only better pedagogy but better mental hygiene.

c) A third type of objective consists purely of teachers' objectives. From the standpoint of the pupil, they may be called *indirect* objectives. In the beginning the pupil is not interested in them at all. The teacher may be more interested in them than in anything else. Examples of these objectives are found in the so-called character objectives, such as sportsmanship, cooperation, and self-confidence.

It would seem that each of these fields of objectives should be carefully formulated, first by processes of philosophical research, bringing to bear upon them the critical examination of the principles of educational psychology, of sociology and of plain common sense; then by subjecting them further to the scrutiny of experimental trial. Philosophical thinking, however, would be needed to decide whether each one is really worth while and to what degree. This question needs to be studied anew about every five years.

3. Our General Teaching Material. We need to re-evaluate about every decade the criteria upon which we base our judgment as to the values of any given material for instruction. For too long we have, as a profession, accepted the *materia gymnastica et athletica* because of tradition. It is suggested that we need more philosophical research in this field as well. We should not only evaluate the old but create the new; the latter should not be created just because it *is* new, but in order that it may accomplish our objectives.

4. Fundamental Teaching Procedure. This subject will be made clear, perhaps, by one or two questions. How can we better apply the principles of mechanics to progression in our physical activities, and how can we state them in such terms and with such sim-

ple illustrations that they may assist the pupil both in his understanding and in his learning? These principles are applicable particularly to the athletic sports and to apparatus work, gymnastics, and tumbling. We believe that progression should be based largely on these principles, rather than upon the older principles of mechanical difficulty and kinesthetic complexity.

We need much more experimental knowledge of the principles of the psychology of physical education. This is particularly true of the psychology of efficiency and improvement as applied to our field. The fields of both mechanics and psychology are primarily problems for experimentation.

5. Techniques of Measurement, Classification and Grading. It is a temptation to step over at this point into the whole field of tests and measurements. May we suggest, however, one or two measurement problems that are fundamental to program.

a) The first problem is one of measuring what might be termed "motor original nature." This is not a matter of one simple test but involves, perhaps, the following items: (*1*) Something corresponding to the intelligence quotient, except that it should attempt to evaluate athletic intelligence or adaptability to new athletic situations rather than to general intelligence. (*2*) Motor educability. This is the field of Brace's test. We need a further contribution in this field, particularly in communities where stunts are taught in the schools. (*3*) Native ability to develop *power*. The writer has some unpublished evidence that the Sargent jump is a much more valid measurement of this trait than is generally assumed. (*4*) A measurement of size and maturity. This would, of course, change from time to time. (These four items should give an estimate of the potentialities of the individual and should indicate approximately *what could be expected of him*. Placement in our educational institutions is based on mental ability, not on physical ability. All studies to date have indicated that there is practically a zero correlation between physical ability and mental ability. Because pupils are in the same mental class there is no reason to believe that they are equal or even homogeneous in physical ability. A student who is properly placed mentally may be badly placed physically. The physical educator cannot logically fail such a student who, though a *motor* moron, is functioning to something near the upper levels of his own potentialities.)

b) A second battery of tests should be developed which will measure as adequately as possible an individual's physical condition; probably Rogers' physical fitness index plus an endurance index* might be adequate for such a purpose.

c) A third set of tests is needed to indicate strength; for this, adequate tests are available.

* We are experimenting at the University of Iowa with an index obtained by dividing the pupil's 220 yard time by his 60 yard time.

d) A fourth battery is needed to determine both static and dynamic body mechanics. Brownell's scales for posture are probably the best we have for the former, and Burpee's test of agility (the number of times the individual can squat to the squat rest and extend the legs to the front leaning rest and return to the standing position in a given number of seconds) is about the best we have at present. More work is needed in this field. Particularly do we need objective and quantitative measures of static body mechanics.

e) Finally, we need a battery of tests to give us *relative* athletic ability. By relative ability is meant athletic ability relative to the individual's size and maturity.

From such a group of measurements, it should be possible to evolve a satisfactory system of classifying pupils into homogeneous groups, and to devise a method for grading individuals that would be fair both to the individual and to the institution. This kind of research would, it seems to us, put program ahead a long way.

Research in Unit Activities

A second set of researches should center around *each chosen activity.* These will be outlined briefly.

1. The objectives of each activity. The formulation of these would assist greatly in determining the relative values of each activity. These objectives should be classified into direct, associate, and indirect, in the same manner as suggested for the general objectives.

2. We should suggest that studies of pupil attitude toward each activity would be profitable. To illustrate; the male pupil's attitude towards interpretative dancing is usually that it is rather "sissy." Yet this dancing is an exceedingly valuable educational activity. It is probable that experimental studies might develop adequate methods of changing such attitudes. Another example may be found in a possible indication of pupil attitude toward calisthenics. Y. M. C. A. studies of young men's programs indicate that sixteen per cent of the non-members marked it as a preferred activity. A somewhat larger percentage of those who read "Physical Culture" than of those who do not, prefer calisthenics. Studies as to why individual students do or do not prefer an activity, together with what changes in content or presentation would cause him to favor it, should be useful contributions.

3. What is the best *content* for each activity? In general, each activity has a larger possible content than can be utilized. Educationally, what is the best of all this wealth of material?

4. How should this material be organized? For example, in teaching basketball we might:

a) Just teach the group to play the game by playing it, teaching entirely by the "whole" method.

b) We might teach it somewhat as it is taught to varsity teams.

c) We might organize the content in yet other ways, particularly for those of lesser abilities. These might vary all the way from mimetic calisthenics to playing the game. Such "'best" organization of content is one of our important problems.

5. Organization of teaching material. By this is meant organization of material as related to motivation, pedagogical progression, and the general use of the principles of the learning process. The relative balance of the "whole" method and of the "part" method of instruction, and the order of presentation from the standpoint of the laws of mechanics are illustrations to the point.

6. Teaching procedure. What is the general method of presentation? It may be anything between the two extremes of complete teacher dictation on the one hand, to utter unguided use of the project method on the other.

7. Pupil activity. When the teacher does a certain thing and presents a certain situation, what does he expect the *pupil* to do? What *does* the pupil do? These items and that of teacher procedure are closely interrelated, and the one cannot be studied without studying the other.

8. Measurement of results. This is suggested here in relationship to the measurement of improvement in each activity which, of course, involves measurement of the initial and the final status. This would take us into the whole field of achievement tests and standards.

Following the above researches in logical order, would come studies involving the synthesis of unit activities to achieve the best total results. This is the kind of thing that is frequently called "formulating a system of physical education." It will and should differ not only in different countries but in different parts of one country. It will differ for the two sexes and for different ages.

Research in Organization

Next is suggested research concerned with the organization and the administration of program. Only three problems will be suggested here as illustrations:

1. There is considerable evidence that motor ability varies in something approaching the normal probability curve just as do many other abilities. Most of the intensive studies have been made on problems of improving the performance of the best ten per cent. This, like the testing of specially built automobiles in five-hundred-mile races, has been of value; but just as our road cars are not built like racing automobiles, so the mass of students is not comparable to this group of the athletic elect. There should be many more studies of program for every segment of this normal distribution of abilities.

2. As a second problem related to this, but important enough to be listed by itself, is suggested a study of program for the motor

sub-normals, who may be *intellectually* quite normal. They may be only the bottom ten per cent, but let us remember they are just as many numerically as the group composing the varsity squads, and our religious friends would tell us that their souls are just as important. If we believe in physical education as a contributor to the richness of living, should we not devise methods to provide a real physical *education* for this group?

3. A third group of studies in this field would be that of group motivation. The writer was told just the other day by a teacher from Denmark that gymnastics there are more popular than athletics are in our institutions. What are the principles behind general student interest or lack of interest in our programs? This will, of course, be related to excellence of teaching and to selection of content. It is also related to subtle psychological factors, but these psychological factors, our advertising friends have shown us, can be changed.

Measurement of Total Results

One final group of problems centers around the measurement of the total results of our program of physical education. If challenged, as one institution has been challenged within the last year, to prove that our required physical education is worth the time given to it, how many of us could bring forward concrete results, objective in nature, that would satisfy the psychologist, the physiologist, and the educator? If it is not possible for us to do this, should it not be one of the items on our research agenda of the next five years?

To sum up, it would seem that there is need for:

1. A more definite philosophical background of method.
2. More definite philosophical hypotheses of organization of details of method, and
3. Much more experimentation on method.

The 1931 Health Education Survey*

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THE report of the health education survey recently conducted by the department of health education is of necessity a tentative one. The survey is not completed but we are glad to present what data we have to the Educational Conference. The report is organized under three headings: (1) Purposes of giving survey; (2) organization of the survey; (3) tentative findings.

The health education department in cooperation with the research department gave a series of tests in health to approximately 10,000 children during the week of January 19, 1931. These tests were devised by the American Child Health Association and consisted of a matching test, a true-false test, a story test, and a five rules test. These tests purport to measure health knowledge, health attitude, and health behavior. It is quite clear that they, as other tests, doubtless measure knowledge better than either attitude or behavior but as the health education program is deeply concerned with making each child positive, dynamic, and effective the department is eager to use the best available measure of these all important phases of health, namely attitude and behavior. Although the tests were devised primarily for boys and girls in grades 5A and 6B, we used them vertically from grade 4 through grade 12 with the advice of Dr. Raymond Franzen of the American Child Health Association. A short preliminary study had shown growth from grade to grade and it was thought desirable therefore to get this broader picture of health knowledge and health attitudes within the limits of these tests.

The purposes of the survey were as follows:

1. To survey certain grades to determine as far as possible present health knowledge and attitudes. This is a preliminary step to developing a course of study in health education from grades one to twelve inclusive.

2. To aid pupils in appraising, within the limits of these tests, their own health knowledge and behavior.

3. To serve a diagnostic purpose for the teacher in helping her to determine the growth of pupils in health knowledge and health attitudes.

* A paper read at the 36th Annual Convention of the American Physical Education Association, Detroit, Michigan, April, 1931.

4. To evaluate teaching on judgments other than subjective ones and to get definite data upon which to form standards for improvement of teaching. Tests should be used again in a few years to show growth in teaching.

5. To utilize results for research purposes. Data can be used in other studies experimentally.

6. To aid in the validation of these tests. The development and improvement of research in this field should be of great value to Detroit as well as to the country in general.

7. To be able to compare standing of Detroit in these tests with that of other large cities.

The object of this survey was not only to obtain a picture of health knowledge and attitudes of the boys and girls, but to serve as an educational experience for health education teachers as well. With that in view all tests were given and scored by health education teachers.

The organization of the survey was as follows:

1. *Horizontal Survey.*—Between 2,000 and 3,000 tests were used in the fifteen schools which had been spotted over the city to ensure as wide a range as possible considering such items as economic status, nativity stock, intelligence and age. *All* the pupils in Grade 5A and Grade 6B in each selected school were tested in order that the possibility of selection might be avoided.

2. *Vertical Survey.*—Approximately 10,000 tests were used in grades 4 through 12. The schools were of average intelligence and presented a representative variety of social backgrounds.

Two high schools were selected which together gave the average picture mentioned above. The two intermediate schools and all the elementary schools which contributed to their enrollment were tested. The A. grades were selected because they give a more typical picture of children in grade at age than do the B grades. The grades used for the vertical survey were 4A, 6A, 8A, elementary; 7A, 8A, 9A, intermediate; and 10A, 11A, and 12A, high schools.

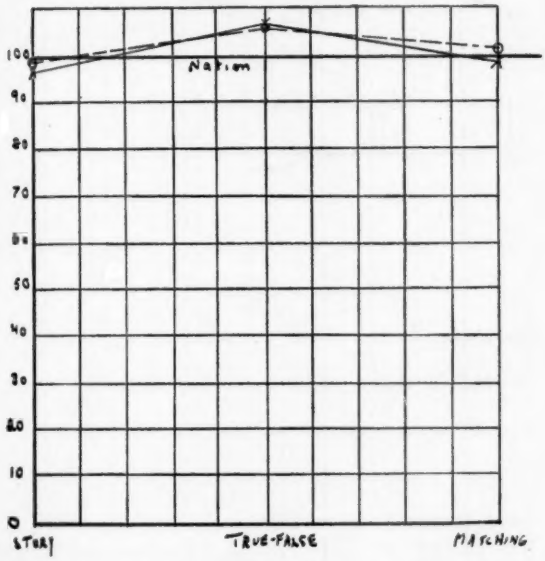
Tentative Findings

The results are presented in terms of Sigma Index units so that comparisons may be made with national norms. In the A.C.H.A. tables the average score made by children is represented by 100 and the unit of variability (sigma) is represented by 20 Sigma Index units. Then, a child who has a Sigma Index score of 120 in any test is 1 sigma above the average in that test. One hundred is average for one's group and deviations above and below 100 mean better or worse than average respectively. Because the Detroit survey has not yet grouped results according to intelligence, the "Sigma Indices not grouped for intelligence" were used.

HORIZONTAL SURVEY: *that is, the survey of pupils in Grades 5A and 6B from 15 schools representative of the entire city:*

FIGURE 1

HORIZONTAL SURVEY—5A-6B: x—x BOYS (826 Cases); o—o GIRLS (849 Cases). SIGMA INDEX UNITS.



1. In all tests girls show a higher median than boys, the widest difference being in the Story Test.

Boys 38.9 Girls 46.6

2. In terms of Sigma Index Units which are based on separate norms for boys and girls, the difference between boys and girls in Detroit is approximately the same as in the nation.

S.I. Boys 96.8 S.I. Girls 98.6

3. In terms of Sigma Index Units Detroit is very slightly below the nation in the Story Test. B. 96.8—G. 98.6; higher in the True-False. B. 105.8—G. 105.6; and approximately the same in the Matching Test B. 98.8—G. 101.2.

VERTICAL SURVEY—*that is, the survey of pupils of average intelligence and socio-economic status:*

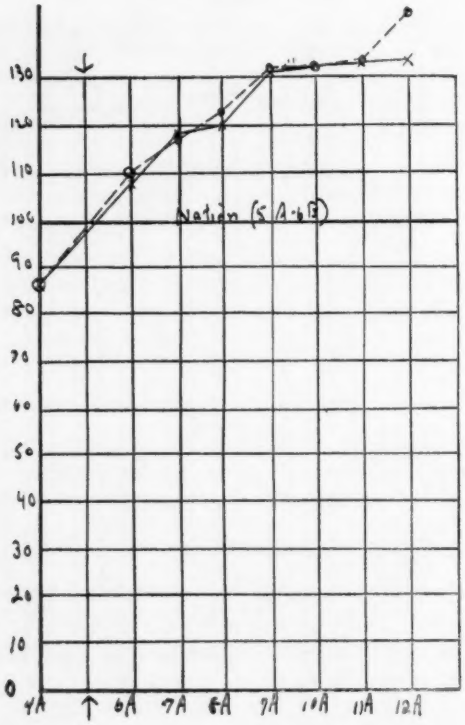
1. True-False Test—All slides except that on Five Rules are presented in terms of Sigma Index Units. These S.I. Units are based on norms for Grades 5A and 6B.

X————X is Boys' Line (2455 cases).

O————O is Girls' Line (2815 cases).

a) In this and the two subsequent slides we see expected growth from grade to grade.

FIGURE 2
VERTICAL SURVEY—TRUE-FALSE. 5A-6B: x—x BOYS; o—o GIRLS. SIGMA INDEX UNITS



b) Reading ability is doubtless a factor in scores in all tests.
c) The differences between boys and girls in Detroit is the same as that in the nation. The girls in Detroit are slightly superior to the boys.
d) This is one of the tests that to a large degree measures knowledge.

2. Matching Test—

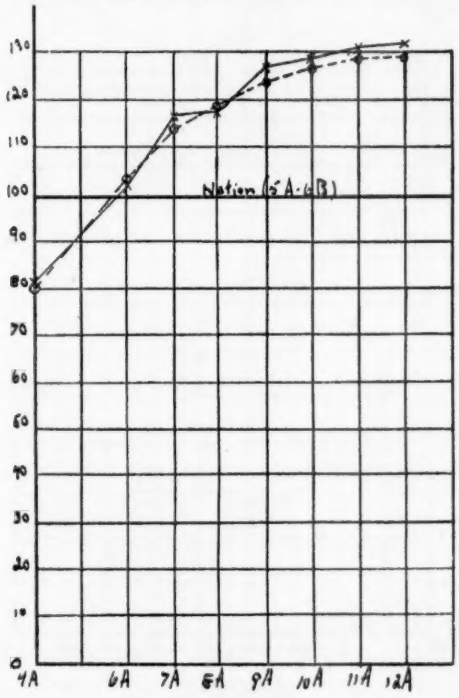
a) Growth from grade to grade.
b) Reading ability again doubtless a factor.
c) Differences between boys and girls slight, *boys* doing slightly better than girls.
d) This also is one of the tests that to a large degree measures knowledge.

3. Story Test—

a) This test attempts to measure health attitudes and health con-

FIGURE 3

VERTICAL SURVEY—MATCHING. 5A-6B: x—x BOYS (2455 Cases); o—o GIRLS (2815 Cases). SIGMA INDEX UNITS



viction as well as knowledge. The test is made up of stories which are of interest to children and which contain health concepts. The child is to underline items which are *good for health* and cross out items which are *bad for health.*

b) Growth from grade to grade.

c) Reading ability is again doubtless a factor.

d) Differences between boys and girls are more marked in the Story Test than in any other. The widest differences in raw scores is in 8A boys 54.0—Girls 65.4 but these differences when translated into Sigma Index Units show that girls in Detroit are slightly more superior to boys in Detroit, than girls are to boys in the nation—Boys 115.0—Girls 121.2. Since these norms are based on the 6th grade it does not mean that pupils in grade 8A are superior to 8A children in the nation.

e) On the other hand in the 9A where the differences in S.I. Units are as great, i.e., Boys 123.2—Girls 117.1, the raw scores show very little difference—Boys 60.2—Girls 62.2.

f) The 7A results show a reverse picture of the 8A results.

FIGURE 4
VERTICAL SURVEY—STORY TEST. 5A-6B: x—x BOYS (2455 Cases); o—o GIRLS (2815 Cases). SIGMA INDEX UNITS

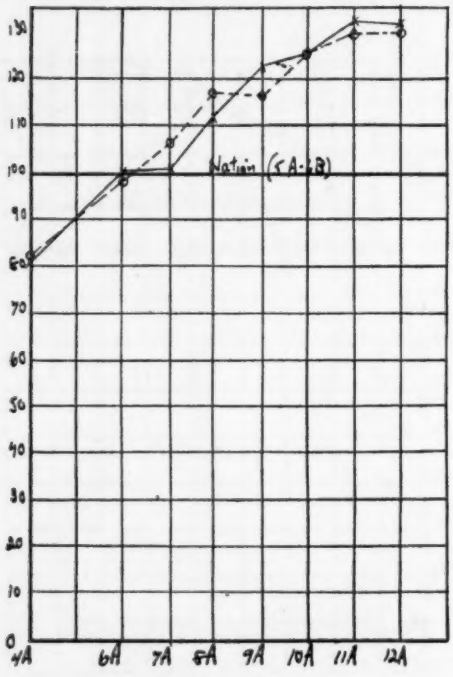
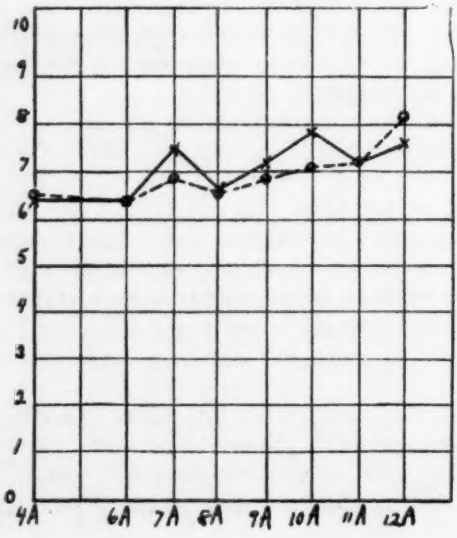


FIGURE 5
VERTICAL SURVEY—FIVE RULES. x—x BOYS (2455 Cases); o—o GIRLS (2815 Cases). MEDIANS



4. Five Rules Test—

a) This slide is given in terms of raw scores—medians, because results should not show growth from grade to grade and therefore no norms are worked out.

b) This test attempts to measure health attitude. Pupils are to check ten items out of a list of twenty; things which they would like to do for one month. It is the first test given in the battery of four and pupils do not know that it is a health test. There are such items as: (1) Obey your parents promptly without asking questions; (2) Do not cheat in school examinations; (3) Sleep long hours with windows open.

c) This test shows practically no range between grades. From grades 4A through 12A medians range from 6.4 to 8.2. But in each grade scores range from 0 to 10 and there is therefore a much wider range within a given grade than between the grades.

d) The high score in 7A (7.5) may be due to the fact that, owing to wrong delivery of tests, the Five Rules test was given *after* the other tests instead of *before.*

FURTHER STUDY—*In addition to the survey already made the following study will be initiated this semester:*

A random sampling of 500 cases will be made in the 5A and 6B grades. The following data will be secured:

Age; grade; sex; color.

Scores on each test as in the first survey.

Intelligence rating; height; weight.

An approximate estimate of: economic status; social background.

Data on physical defects including: teeth; vision; tonsils; hearing; heart; orthopedic defects.

From analysis and interpretation of these data and with the statistical aid of the American Child Health Association we may hope

HEALTH EDUCATION SURVEY
Medians for Grade Groups—January, 1931

Test	Five Rules		Story Test		True-False		Matching		Total Score	
	B	G	B	G	B	G	B	G	B	G
4A	6.4	6.5	25.6	32.9	53.7	56.2	26.0	29.0	108.3	122.8
H5A	6.6	6.7	36.2	44.7	63.2	64.6	33.7	38.1	138.8	152.3
H6B	6.5	6.5	41.2	48.2	66.2	68.1	36.8	40.9	149.9	160.9
6A	6.4	6.4	41.9	47.8	66.5	69.0	37.5	41.0	150.5	162.4
7A Int	7.5	6.8	42.2	53.5	72.1	72.7	44.5	45.8	161.3	175.2
8A El	6.6	6.6	54.0	65.4	73.1	75.4	44.9	48.7	177.5	192.0
8A Int	6.8	6.8	49.5	57.9	72.2	75.9	44.8	47.0	174.2	184.8
9A Int	7.2	6.8	60.2	62.2	79.6	80.7	50.6	51.0	196.2	198.9
10A	7.8	7.1	62.5	69.2	81.3	81.9	51.1	53.0	197.7	208.5
11A	7.2	7.2	68.7	72.9	81.0	82.6	52.5	53.4	205.8	213.0
12A	7.6	8.2	67.2	72.1	81.7	84.6	53.2	53.4	206.9	215.8

to obtain further light upon the relationship of such items as intelligence, height, weight, economic status, nativity stock, and defects to health knowledge and health attitudes within the limits of the tests used.

HEALTH EDUCATION SURVEY

Medians and Sigma Indices for Grade Groups—Horizontal Survey

Test	Five Rules		Story Test		True-False		Matching		Total Score		No. Tested	
	B	G	B	G	B	G	B	G	B	G	B	G
5A Med.	6.6	6.7	36.2	44.7	63.2	64.6	33.7	38.1	138.8	152.3	401	367
5A S.I.			94.2	96.6	103.3	102.0	96.2	98.2				
6B Med.	6.5	6.5	41.2	48.2	66.2	68.1	36.8	40.9	149.9	160.9	425	482
6B S.I.			99.8	100.3	108.3	108.5	101.6	103.8				
Highest Pos. Score		10		110		82		63		275		

	Story		True-False		Matching	
	B	G	B	G	B	G
5A and 6B Averaged	38.9	46.6	64.7	66.4	35.2	39.6
	96.8	98.6	105.8	105.6	98.8	101.2

HEALTH EDUCATION SURVEY

Medians and Sigma Indices for Grade Groups—Vertical Survey

Elementary Grades

Test	Five Rules		Story Test		True-False		Matching		Total Score		No. Tested	
	B	G	B	G	B	G	B	G	B	G	B	G
4A Med.	6.4	6.5	25.6	32.9	53.7	56.2	26.0	29.0	108.3	122.8	641	618
4A S.I.			81.0	82.6	86.5	86.5	82.0	80.0				
6A Med.	6.4	6.4	41.9	47.8	66.5	69.0	37.5	41.0	150.5	162.4	558	576
6A S.I.			100.6	99.7	108.8	110.0	103.2	104.0				
8A Med.	6.6	6.6	54.0	65.4	73.1	75.4	44.9	48.7	177.5	192.0	278	296
8A S.I.			115.0	121.2	120.0	121.6	115.2	119.4				
Highest Pos. Score		10		110		92		63		275		

Intermediate Grades

Test	Five Rules		Story Test		True-False		Matching		Total Score		No. Tested	
	B	G	B	G	B	G	B	G	B	G	B	G
7A Med.	7.5	6.8	42.2	53.5	72.1	72.7	44.5	45.8	161.3	175.2	188	205
7A S.I.			101.3	107.2	118.2	117.0	116.0	113.6				
8A Med.	6.8	6.8	49.5	57.9	72.2	75.9	44.8	47.0	174.2	184.8	139	215
8A S.I.			110.0	112.2	118.3	122.5	116.6	116.0				
9A Med.	7.2	6.8	60.2	62.2	79.6	80.7	50.6	51.0	196.2	198.9	94	171
9A S.I.			123.2	117.1	130.5	131.4	127.2	124.0				
Highest Pos. Score		10		110		92		63		275		

High School Grades

Test	Five Rules		Story Test		True-False		Matching		Total Score		No. Tested	
	B	G	B	G	B	G	B	G	B	G	B	G
10A Med.	7.8	7.1	62.5	69.2	81.3	81.9	51.1	53.0	197.7	208.5	261	343
10A S.I.			125.4	125.3	133.5	133.5	128.8	128.0				
11A Med.	7.2	7.2	68.7	72.9	81.0	82.6	52.5	53.4	205.8	213.0	170	238
11A S.I.			133.6	129.9	133.0	134.5	131.0	128.8				
12A Med.	7.6	8.2	67.2	72.1	81.7	84.6	53.2	53.4	206.9	215.8	126	153
12A S.I.			131.6	129.1	134.0	138.2	132.4	128.8				
Highest Pos. Score		10		110		92		63		275		

FIGURE 6

FIVE RULES—GIRLS 6B; AGE 11; MEDIAN 6.5; NO. CASES 257

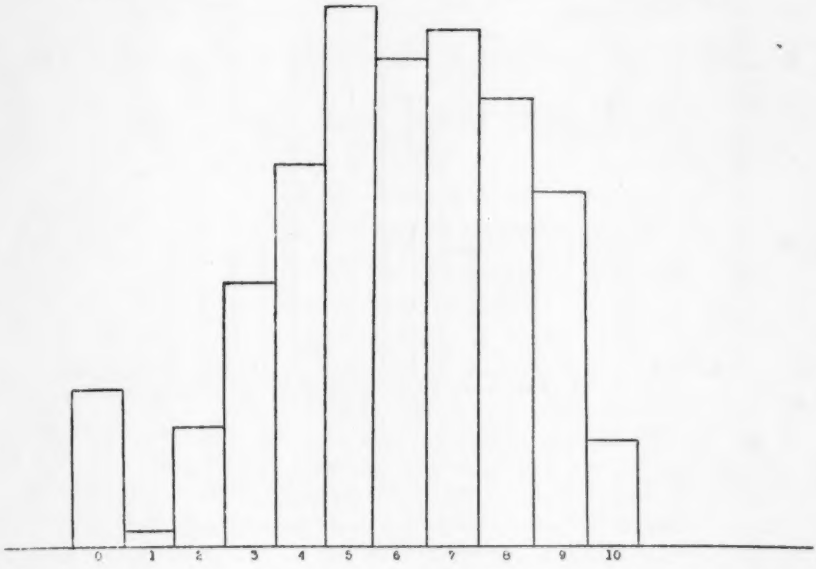


FIGURE 7

STORY TEST—GIRLS 6B; AGE 11; MEDIAN 48.2; NO. CASES 257

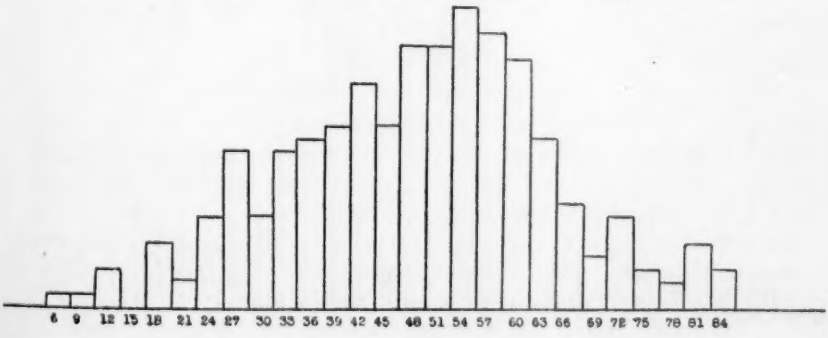


FIGURE 8

TRUE-FALSE—BOYS 6B; AGE 11; MEDIAN 66.2; NO. CASES 183

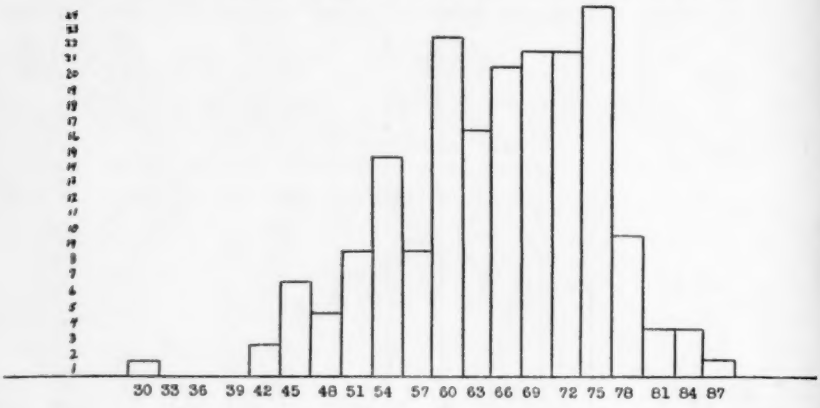
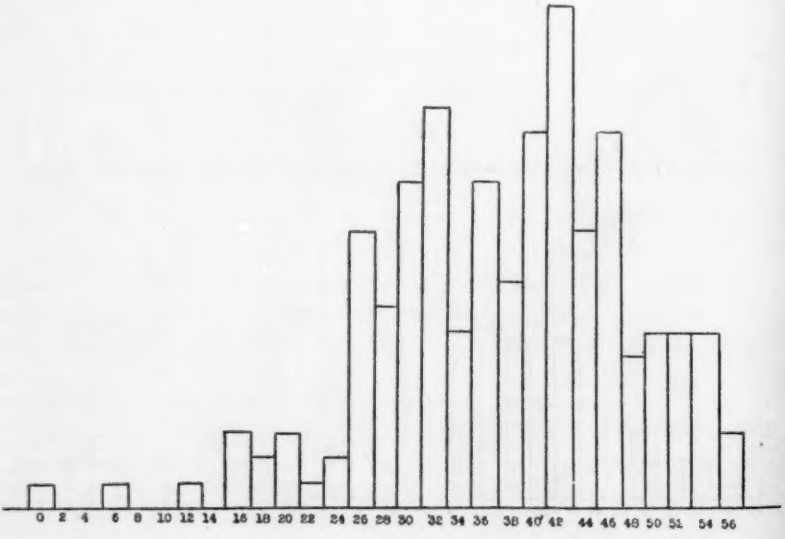


FIGURE 9

MATCHING—BOYS 6B; AGE 11; MEDIAN 36.8; NO. CASES 183



Relationship Between Running Events in Track and Reaction Time

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WHEN one considers the essential principles involved in running events in track competition, it is evident that in the shorter distances, the time required for leaving the mark is more important than where the greater distances are to be covered. If this is true, the individual with the shortest reaction time has an advantage in the shorter events, if other factors such as skill and physical condition are equal.

This investigation was undertaken in order to determine whether there is a difference between the reaction times of those running the short distances and those who specialize in the distance events and also to see if there is any correlation between speed in running and reaction time.

An examination of the literature yields little information on this question. Griffith[1] has studied the reaction time of athletes quite extensively but has not considered his data from the standpoint of their relation to distances run or speed in covering them. He has, however, grouped athletes into the motor-minded type with a mean reaction time of .180 sec. and the sensory-minded with a mean reaction time of .290 sec.

The Technique

In this investigation data were collected from a group of track men involving the recognized distances run in competition. Their reaction time was measured by a Dunlap chronoscope and their speed in running in actual time trials.

THE CHRONOSCOPE. This apparatus is so generally used for measuring reaction time that a detailed description of it is unnecessary. However, in this laboratory, the reaction time circuits have been simplified so as to reduce to a minimum the errors due to open-

[1] Griffith, C. R., "Psychology and Athletics." Chas. Scribner and Sons, 1928.

ing and closing the stimulus-response circuits. This feature of the apparatus used seems worthy of description and thus it is shown in detail in Fig. I. In this arrangement of circuits the stimulus key is

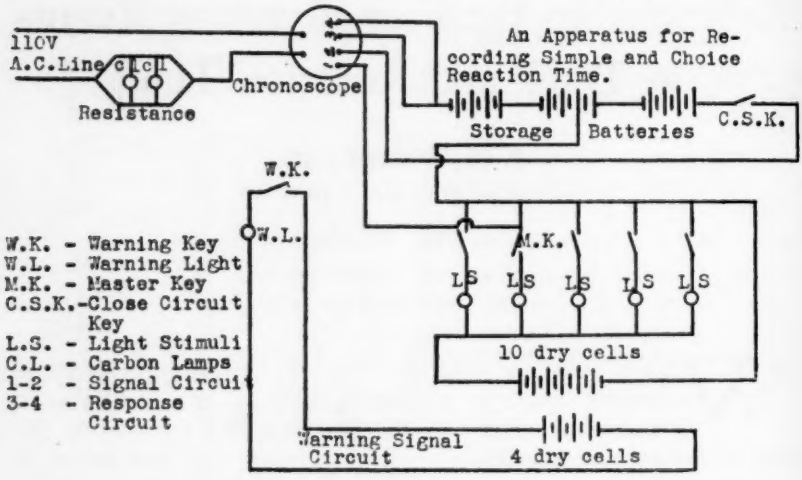

FIGURE I

This figure shows in detail the arrangement of the stimulus-response circuits as arranged for recording simple and choice reaction time.

equipped with a double contact, one in series with the storage batteries, the stimulus and the back magnet on the chronoscope and the other in series with the batteries, response key and the front magnet. The response key is in separate circuit with the storage batteries and the front chronoscope magnet. A voltage balance between the front and back magnets is established so that when the stimulus-response circuits remain closed at the same time, the power of the response circuit overcomes that of the stimulus circuit. When the stimulus is given, the back magnet is activated, thus starting the dial hand. This contact is maintained until the response is made. Since the power of the response magnet is definitely greater than that of the stimulus magnet, the dial hand is instantly stopped. The response contact is held until the reading is made. The reaction time is represented as the difference between the stimulus and the response as indicated by the dial hand in 1/1000 seconds. The chronoscope in use in our laboratory is equipped with a dial for 50 cycle current. Since the alternating current available is 60 cycle, each reading is multiplied by 6/5.

THE TIME RECORDS OF THE RUNNERS. In order to secure time records, each subject ran 75 yards three times on three different occasions. The best time made in the three trials is considered as the record of the subject in the event. In order to assure uniformity and accuracy, the methods used in competition were observed.

In the case of the group designated as "champions" the best record in the 75 yard dash, as recorded by the track instructor, is considered as their time record.

The Data

Twenty-two university track men who were in training are used as subjects for this investigation. This group includes three champions, four short distance men, eight middle distance men and seven distance men.[3]

Each subject, exclusive of the "champion" group, came to the laboratory and was given fifty practice trials in responding to a light stimulus. The only instruction given was to respond by pressing a key as soon as the light stimulus was seen. After the practice period, each subject came to the laboratory on ten different days, distributed over a fifteen day period. On each occasion, fifty reactions to a light stimulus were recorded, thus making a total of five hundred readings as a basis for establishing the mean reaction time.

Two of the "champion" group came to the laboratory on thirty different occasions over a period of sixty days. Each time fifty responses to the light stimulus were recorded, making a total of fifteen-hundred readings. The third champion came eight times over a period of twelve days thus giving a total of four hundred records. Conditions which could not be controlled necessarily terminated the experiment in the case of this subject.

The "Champion" Group. This group includes the national high school 440 yard dash champion for 1930, the present world's champion 220 yard low hurdler and the national intercollegiate 220 yard dash champion for 1922. A summary of the data collected from this group is shown in Table 1. The mean reaction time for these men is .121 sec. with a range of .118 to .124 sec.

TABLE 1

This Table Shows the Mean Reaction Time and the Time Records of the "Champion" Group

Subject	Events	Reaction time range	Mean reaction time sec.	Time record in 75 yd. dash
2	220 yard dash	.051-.175	.118	7.8 secs.
3	220 yard low hurdles	.065-.172	.124	7.6 secs.
4	220 yard dash	.056-.164	.122	7.6 secs.

Mean reaction time for group .121 secs.

The Short Distance Group. This part of the investigation includes four men who are specialists in the short distance races. The data obtained from them are shown in summary form in Table 2.

[3] For the sake of discussion running events in track have been classified as (1) short distances, those up to and including the 220 yard dash, (2) the middle distances, the one-fourth and one-half mile and (3) the distance runs, the one and two mile events.

The mean reaction time for this group is .131 sec. with a range of .130 to .132 sec.

TABLE 2

THIS TABLE SHOWS THE MEAN REACTION TIMES AND THE TIME RECORDS OF THE SHORT DISTANCE RUNNERS

Subject	Events	Mean reaction time sec.	Time record 75 yd. dash
1	100 and 220 yd. dash	.131	7.6 secs.
5	100 and 220 yd. dash	.130	7.8 secs.
6	100 and 220 yd. dash	.132	8.0 secs.
7	100 and 220 yd. dash	.132	7.9 secs.
	Mean reaction time for group .131 sec.		

THE MIDDLE DISTANCE GROUP. There were eight representatives of the middle distance events investigated. Table 3 shows a summary of the data collected from these subjects. The mean reaction time for the group is .149 sec, with a range of .134 to .156 sec.

TABLE 3

THIS TABLE SHOWS THE MEAN REACTION TIMES AND THE TIME RECORDS OF THE MIDDLE DISTANCE GROUPS

Subject	Event	Mean reaction time sec.	Time record 75 yd. dash
8	¼ mile run	.134	8.1 secs.
9	¼ mile run	.145	8.2 secs.
10	¼ mile run	.146	8.3 secs.
11	½ mile run	.146	8.3 secs.
12	¼ mile run	.151	8.3 secs.
15	½ mile run	.155	8.5 secs.
16	½ mile run	.155	8.7 secs.
17	¼ mile run	.156	8.8 secs.
	Mean reaction time for group .149 sec.		

THE DISTANCE GROUP. This part of the experiment includes seven subjects. A summary of the data collected from them is given in Table 4. They reveal the fact that the mean reaction time is .169 sec. with a range of .155 to .187 sec.

TABLE 4

THIS TABLE SHOWS THE MEAN REACTION TIMES AND THE TIME RECORDS OF THE DISTANCE GROUP

Subject	Event	Mean reaction time sec.	Time record 75 yd. dash
13	2 mile run	.155	9.0 secs.
14	1 mile run	.155	8.5 secs.
18	2 mile run	.158	8.9 secs.
19	2 mile run	.164	8.9 secs.
20	2 mile run	.182	8.9 secs.
21	1 mile run	.182	8.6 secs.
22	2 mile run	.187	9.0 secs.
	Mean reaction time for group .169 sec.		

Summary

A summary of the data collected in this investigation brings out a number of very definite facts concerning the relation of reaction time to running various distances as well as its relation to speed in covering these distances.

THE "CHAMPIONS." When the mean reaction time of the "champion" group is compared with the means of the other groups it is evident that they respond definitely faster. When individual means are compared, the data show that the slowest responding champion is definitely faster than the fastest responding subject in any of the other groups by .006 sec.

THE RELATION OF REACTION TIME TO DISTANCES RUN. That there is a definite difference between the mean reaction times of the subjects studied when they are grouped on the basis of the distance of the events in which they have specialized is clearly shown by the following comparison:

	Mean reaction time
Short distances	.131 sec.
Middle distances	.149 sec.
Distance	.169 sec.

On the basis of the data presented in this experiment the speed of the reaction time is definitely related to the distance run. As far as this investigation is concerned no data are available from which to conclude whether this relationship is due to innate ability, training or a combination of these two things.

THE RELATION EXISTING BETWEEN SPEED IN RUNNING AND REACTION TIME. In order to determine whether there exists any relationship between speed in running the 75 yard dash and reaction time, a coefficient of correlation[3] between the reaction times and the time records of the whole group was determined. This was found to be .863. This coefficient is so high that on the basis of the data collected in this investigation, there exists a high degree of relationship between reaction time and speed in running a short distance. The probable error is not given since this is not a random sampling correlation and therefore it is meaningless.

Attention is directed to the fact that the relationship which exists between reaction time and speed in running is very significant since the data presented is not a random sampling but is a very select group of individuals who are well trained in the events in which they compete.

Conclusion

The data presented in this investigation justify the following conclusions:

[3] $r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 . \Sigma y^2}}$

1. The mean reaction time (.121 sec.) of a group of champions is definitely shorter than that of any group studied regardless of the distance run.

2. The mean reaction times of the distance groups as defined in this investigation are distinctly different. The short distance men respond fastest (.131 sec.); the middle distance men are next in speed of response (.149 sec.); and the distance men have the slowest reaction time (.169 sec.).

3. There is a high degree of relationship between speed in running 75 yards and reaction time. The coefficient of correlation is .863.

The Validity of Antero-Posterior Spinal Measurement*

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I. Need for Precise Measurements of the Spine

THE lack of a suitable method of measuring antero-posterior spinal curvature is the cause of much of the uncertainty related to the status of the corrective program in school work. There are, to date, no worthwhile quantitative studies showing the precise effects of corrective exercises upon the spine. For instance, what specific and immediate effect have hanging exercises? What effect is caused by changing the body weight when standing so as to cause the center of gravity to move forward or backward over the base of support? The effect of this lean forward or backward is related to the important study of compensation in the curves, i.e., changes in the curves to meet the mechanical demands of changes in the center of gravity. Does a change in the thoracic curvature necessarily affect the lumbar curve?

Studies are needed which show the specific changes in habitual posture due to fatigue, occupation or even certain mental states, although these latter would require very special techniques for objective control of the results. Do the curvatures really increase from morning till night due to fatigue produced by the constant pull of gravity upon the head and other body segments? Is habitual posture poorer after severe exertion in athletic contests than before?

On one hand it is claimed that very little good can be accomplished with the present methods used in school work, and on the other hand much enthusiastic work is being done upon the firm belief that much good is being accomplished. What if it should be demonstrated in time to be largely a waste of time and money? Certainly it is recognized that games and other activities are better for wholesome social-mental-physical activity than the more or less cut and dried corrective procedures. However, the use of the term "body-building" by Mr. R. J. H. Kiphuth, at Yale, has a psychological advantage which is helpful in motivating interest in the corrective program. Also, the

* Paper presented in the therapeutic section at the Eastern Regional Convention of the American Physical Education Association, Trenton, N. J., May 1, 1931.

quantitative testing of the strengths of the postural groups of muscles which has been carried on at Springfield for the past several years is considered to be a strong motivating influence. It is evident that physical educators are in a weak position with regard to what is definitely being accomplished—and, mind you, that it is not said that good is not being accomplished. No one has taught corrective work with more enthusiasm than the writer.

The special orthopedic case merits more careful attention regarding the specific effect produced by operations or special exercises. On a recent visit to one of the best crippled children's hospitals with modern equipment for the purpose of seeking information about measuring posture, the head nurse was asked if exercises played an important part of the procedure in straightening spinal curvatures. She replied that they certainly did. Pushing the point a little further, she was asked if the straightening could really be produced by the exercises. Again the nurse replied that the exercises produced a definite corrective effect. However, when she was asked how she knew, the only evidence which could be given was that the children appeared a little straighter. Then, she confessed that the weakest part of the program was the lack of definite records and objective indication of improvement both immediate and permanent.

Postural scales for grading posture have come in for much discussion and critical analysis. They are tremendously important because the practical work of the teacher, who is not specially trained, will depend to a large extent upon the efficiency of these scales as an aid to rating posture. These scales to date are primarily based upon judgment of experts, the latest technique being that of judging silhouettes and the resort to statistical procedures to show the intercorrelation of the judgments. There have also been many attempts to produce a satisfactory quantitative procedure. No satisfactory method has as yet been produced which is accepted as being sufficiently accurate for research upon the many postural problems staring us in the face for reliable answers. The great difficulty in arranging scales is apparent in that the location of the center of gravity in the vertical position varies in the antero-posterior plane among individuals of different physical types. For instance, the fat man with a large protuberant abdomen has to lean slightly backward in order to satisfy the fundamental law of equilibrium that the center of gravity must be maintained over the base of support, or else the balance will be lost. Likewise, there are many other variations. In order to meet this mechanical necessity the spine assumes the curvature necessary to meet the condition. This raises the question as to the reason why there are curves in the spine anyway. The French kinesiologist and physical educator, Georges Demeny, gave some good answers to this question in the latter part of the last century. If all of us had clear

ideas about the fundamental mechanical considerations which cause the curves, some of the postural problems would be seen in a new light. The structural inability to assume certain positions must also be recognized in some cases.

Judging postural silhouettes seems to be an unreliable procedure for the following reasons:

(1) The silhouette is misleading and does not represent accurately the true spinal curvatures because it shows the muscular contours of the back, the scapulae and sometimes the elbows.

(2) It is impossible to think of judging these pictures for quantitative comparison when we have tremendous difficulty measuring them accurately, even with the aid of special processes and instruments.

This brings us to the consideration of what practical means we have of measuring antero-posterior posture.

II. Methods of Measuring Antero-Posterior Spinal Curvature

The investigation of the validity of antero-posterior spinal measurements has developed primarily from the interest which we all have in this subject and considerable testing has been done throughout the year by undergraduates, graduates and faculty in the department of Applied Physics and Animal Mechanics, at Springfield College,[1] in an effort to find out something about this problem. The study has grown from an investigation of photographic errors within the lens itself and other errors resulting from a maladjustment of the lens, object and lighting to the specific application of such a photographic study to the problem of the validity of anthropometrical photographs and silhouettes. This in turn led to the comparison of nine different instruments or schemes of recording antero-posterior posture.

The known methods of measuring the antero-posterior curves reduce to three general types of instruments, operating upon different principles, and of which there are several variations of each.

1. *Conformateur Devices*—those designed to fit the spine and take its shape, later to be traced and measured or reduced by the pantograph and measured. Examples: the flexible spine, Demeny's conformateur[2] and several variations of this conformateur as used by Thomas Elkinton,[3] Jay W. Seaver,[4] E. Reynolds and R. W. Lovett,[5] J. F. Rogers and others.

[1] The writer is indebted to David E. Coe, John Burr and Clarence Miller, members of the advanced physics and animal mechanics class, to forty members of the undergraduate physics class and, particularly to Walter Gunby, a graduate student, who is now completing a thesis on additional phases of this problem. Gunby has checked all the computations in this paper.

[2] Demeny, Georges, "Les Bases Scientifiques de L'Education Physique," F. Alcan, Paris, 1903, pp. 305-311.

[3] See Jay W. Seaver, "Anthropometry and Physical Examination," Curtiss-Way Co. Press, Meridan, Conn., 1909, p. 81.

[4] Seaver, Jay W., op. cit.

[5] Reynolds, E. and Lovett, R. W., "A Method of Determining the Position of the Center of Gravity in Its Relation to Certain Body Landmarks in the Erect Position," American Journal of Physiology, May 1, 1909, pp. 286-293.

2. *Spine Tracing Devices*—those that trace the contour of the curves directly by a sliding or rolling contact against the back and some arrangement for a writing point either on the end of a rod without reduction or connected to another arm of a pantograph by means of which the curve is reduced. Examples: Demeny's inscripteur and rachigraph,[6] the pantographs as used by J. H. Kellogg,[7] C. L. Scudder,[8] Jay W. Seaver,[9] W. P. Bowen,[10] R. T. McKenzie,[11] and others.

3. *Photographic Schemes*—those involving the reproduction of an image by means of a lens. Examples: Fradd's silhouettograph[12] and Goldthwaite's method of computing posture from them, the Mosher-Lisley schematograph,[13] straight photography,[14] and X-ray.[15]

There are many other approximate schemes for measuring posture, such as Bancroft's[16] and Crampton's[17] practical tests; no effort has been made to mention them all. While these have great value for the purpose of general postural education, only the schemes which may result in definite quantitative measurements with a fair degree of scientific accuracy and reliability are grouped in the above classification. There are also many postural scales based largely upon the opinions of experts in the field, such as Brownell's[18] "Scale for Measuring the Antero-Posterior Posture of Ninth Grade Boys." *It may be pointed out that the study as presented herein is for a different purpose, not the construction of a postural scale but the quantitative study of the validity of the instruments and methods of obtaining objective measurements in order to determine, first of all, the reliability of the methods of obtaining data.* Once a method is established as being accurate (i.e., reproducing the measurement in its true size) and also reliable (i.e., giving a high degree of similarity between successive trials on the same object), *perhaps* a scale can be constructed on a true objective basis which will give satisfaction.

III. The Experimental Method

It was decided to compare several methods of measuring the antero-posterior curves. Consequently, at first, three instruments were

[6] Demeny, Georges, op. cit.
[7] Kellogg, J. H., see Translations of the American Association of Obstetrics and Gynecology, 1890.
[8] Scudder, C. L., see Boston Medical and Surgical Journal, 1891.
[9] Seaver, Jay W., op. cit., p. 80.
[10] Bowen, W. P., "Applied Anatomy and Kinesiology," Lea and Febiger, Phila., 1923, p. 256.
[11] McKenzie, R. T., "Exercise in Education and Medicine," W. B. Saunders & Co., Phila., 1924, pp. 409-410.
[12] Fradd, Norman W., "Bodily Mechanics at Harvard University," thesis, Springfield College, 1922, pp. 25-35.
[13] See Fradd, op. cit., pp. 25-32.
[14] Such as the method used at Yale University by R. J. H. Kiphuth.
[15] As in use in any therapeutic hospital.
[16] Bancroft, J. H., "The Posture of School Children," pp. 6 and 285, MacMillan, 1919.
[17] Crampton, C. W., "Work-a-Day Tests of Good Posture," American Physical Education Review, pp. 1-5, Nov., 1925.
[18] Brownell, C. L., "A Scale for Measuring the Antero-Posterior Posture of Ninth Grade Boys," Teacher's College, Columbia Univ., No. 325, N.Y., 1928.

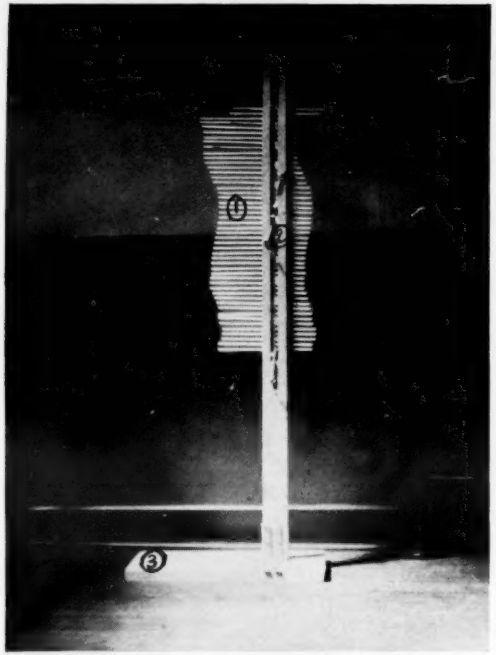
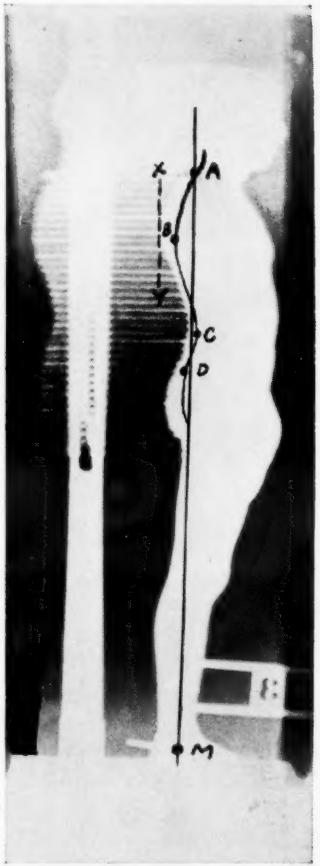


ILLUSTRATION I. THE WOODEN CONFORMATEUR

1. Wooden rods which slide and contact spine.
2. Springs attached to tape for locking rods.
3. Base upon which subject stands with back toward ends of rods.

ILLUSTRATION II. LOCATION OF MEASUREMENTS

A. *Location of the seventh cervical spinous process.* B. *Maximum lateral displacement of the thoracic spine.* C. *Maximum lateral displacement of the lumbar spine.* D. *Maximum lateral displacement of the posterior spine of the sacrum.* M. *Location of the internal malleoli.*



arranged as being representative of the three general methods previously outlined.

1. The Conformateur Used in the Preliminary Measurements[19]

The first conformateur used consisted of a wooden upright erected from a base (Illus. I), the former having a number of spindles sliding horizontally through holes bored in the upright. The spindles slipped easily but could be locked in position by a system of springs attached to cords woven in and out between the spindles. The subject was asked to step on the apparatus and assume normal posture without stiffness. The subject stood with the back toward the rods so that when the rods were gently tapped in place, the tips of the rods just touched the spinous processes of the vertebrae (Illus. II). The spindles were tapped lightly into place without pushing the subject. When they were fitted snugly against the spine, they were locked in place. Just previous to locking, the spindle corresponding to the location of the vertebra prominens (7th cervical spinous process) was pulled out to locate this point and, likewise, the one corresponding to the posterior spine of the sacrum was pulled out conspicuously. The instrument was then placed flat against a blackboard and the spinal curvature as represented by the sticks was traced with chalk. This reproduction was to true size and the measurements were taken laterally from a vertical dropped by means of a plumb line through the 7th cervical point. The measurements taken were:

A—location of the 7th cervical spinous process.

B—corresponding to the maximum lateral displacement of the thoracic spine.

C—corresponding to the maximum lateral displacement of the lumbar spine.

D—corresponding to the maximum lateral displacement of the posterior spine of the sacrum.

M—location of the internal malleoli.

2. The Spinograph Used in the Preliminary Measurements[20]

A spinograph was constructed on a somewhat similar plan to that of Demeny's spinal inscripteur although different in several details. (Illus. III). The subject was asked to stand with his heels against a block and then the tracing point was lightly contacted throughout the entire length of the spine and simultaneously the same movement was traced in full size on a blackboard. The measurements were taken as in the case of the conformateur.

3. The Silhouettograph Apparatus Used in the Preliminary Measurements

The silhouettograph apparatus consisted of the standard equipment, namely,

[19] The original idea of this instrument was taken from Demeny. It was built by Walter Gunby upon suggestion by the writer.

[20] This instrument was made from oak wood by the writer with the assistance of David E. Coe, laboratory tutor.

1 Century Penny Picture Camera-Eastman Kodak Co., Rochester, N.Y., (Betax No. 2 lens with Wollensak Shutter-stop diaphragm 4-128).
5″x7″ p m c No. 1 Bromide sensitized paper.
Screen 42″x84″ made of architect's linen.
1 1000-watt Mazda lamp and reflector.

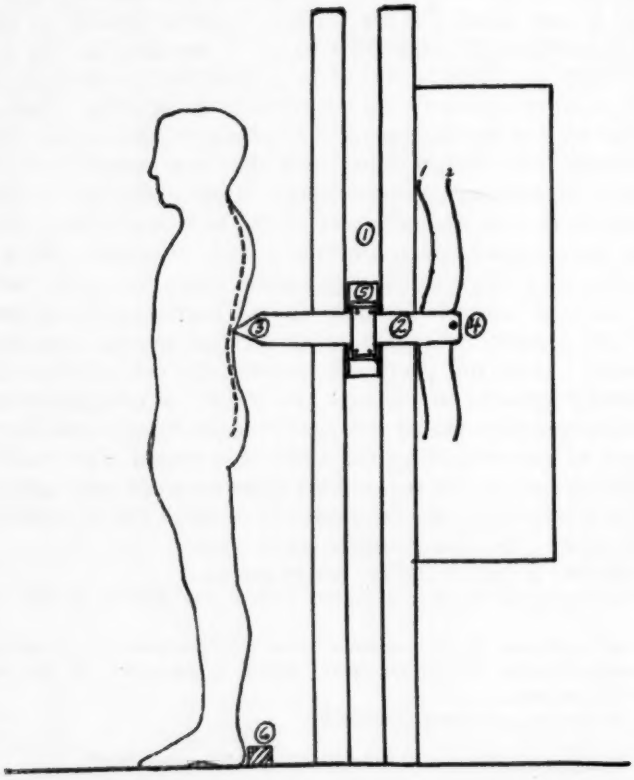


ILLUSTRATION III. HARD WOOD SPINOGRAPH

1. Groove to fit block 5 which slides vertically. 2. Rod which slides horizontally. 3. Contact point which fits snugly to spinous process. 4. Writing point to trace spine in true size on blackboard. 5. Sliding block. 6. Heel block.

Illus. IV shows the schematic diagram of the apparatus with the object placed 11′-0″ in front of the camera lens and 1′-0″ in front of the screen. The lamp and reflector were located 5′-0″ behind the screen and adjusted so that the rays of light would be directed toward the center of the screen.

IV. Results of the Preliminary Measurements

These preliminary measurements gave some interesting results which stimulated additional work on the topic. The results showed

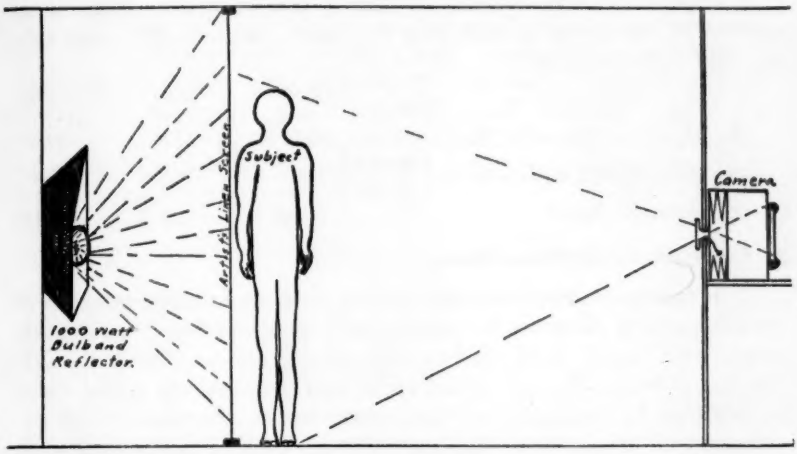


ILLUSTRATION IV. DIAGRAM OF SILHOUETTOGRAPH APPARATUS

that the conformateur and spinograph gave comparable results but the silhouettograph results were greatly in error. The details of this are given in the following collection of data taken on 15 healthy physical course freshmen who were used as subjects. The data is typical of that obtained on many subjects tested.

(a) Data:	Conformateur (cm.)	Spinograph (cm.)	Silhouettograph (cm.)
Max. Thoracic Curvature	R-1.99	R-2.01	R-4.71
Max. Lumbar Curvature	L-2.19	L-1.60	L-1.04
Posterior Spine of Sacrum	R-1.88	R-2.03	R-3.28

Note: The measurements were taken laterally from a vertical erected through the spinous process of the 7th cervical vertebra.

(b) Interpretation of Data:

Measurements taken directly from profile of silhouettes cause:

1. Exaggeration of thoracic curvature.
2. Smaller Lumbar Curve than is the case.
3. Exaggeration of the Displacement of the Posterior Spine of the Sacrum.

This error is known as the "Profile Error." It is clearly indicated on the silhouette shown in Illus. II.

1. Validity

1. *Accuracy*—assuming for the time being that the average of the conformateur and spinograph represent the case truly (note that the two sets of measurements correspond fairly closely), then the profile silhouette in these 15 cases as an average gave the following error:

Maximum Thoracic Curvature	135.4%	Error.(+)
Maximum Lumbar Curvature	44.8%	Error.(—)
Displacement of the Posterior Spine of the Sacrum	68.2%	Error.(+)

2. *Reliability*—determined by taking five successive trials upon each individual using in each case the same examiner, the same subject and same procedure.

	Conformateur	Spinograph	Silhouettograph
Av. % Error About the Mean	12.11	12.11	39.9
Av. Total Range of Variability $\left\{\frac{\text{Range}}{\text{Mean}}\right\}$	32.0	38.9	97.4
Av. Probable Error	±.121	±.124	±1.119

2. Comment on the Profile Error

It is clearly evident from the facts as presented that the usual profile silhouette is valueless for quantitative measurement or evaluation unless some means is adopted to show clearly and accurately the differences between the true spinal curve and the apparent spinal curve as indicated by the profile of the picture or the silhouette. The explanation of this error is obvious inasmuch as it is generally known that men differ in muscular development in the back. The posterior muscles becloud the true case. Also, it has been found that the position of the hands have a lot to do with the appearance of the profile view. On one hand the elbows may project backward and interfere with the true curvature. Whether this happens or not is hard to determine in many cases of small differences. Yet, when an error of a few millimeters in the measurement of the picture is made, there results a much larger error if the measurements are multiplied by the enlargement ratio so as to bring them up to normal size for comparison with the true curve. On the other hand, if the hands are held forward to eliminate this difficulty, the vertebral borders of the scapulae will assume an unnatural position, projecting backward and exaggerating the curvature in the thoracic region.

Any method which is based upon using the marginal outlines of the true silhouette without special correction is erroneous. This applies to the case of locating the center of a segment of the body and using lines to connect these segments in any way. One of our most important methods of measuring posture at the present time is based upon this procedure. The angles between lines obtained by such means must be erroneous and very variable.

V. Validity of the Instruments and Methods by Reproduction of a Manikin of Accurately Known Dimensions

A manikin was measured with the various instruments. This procedure made possible the direct comparison of instruments and methods because of the elimination of errors caused by the inconstancy of the subject in assuming the same position exactly in a series of trials and wobbling slightly during the picture or other type

of measurement. Every measurement in this comparison was repeated by different examiners with a minimum of three trials in each case. All possible precautions were used which were reasonable in measuring the tracings and silhouettes. Vernier calipers were used to measure the distances on the pictures and all lines and points were marked by the finest pointed dividers. All lateral measurements were made by constructing exact right angles to a vertical line represented by a plumb bob.

Results of Comparing Nine Methods of Obtaining Quantitative Results

Ranked in order of Combined Accuracy and Reliability. Average Results on all Points.	Rank Index (Accuracy rank + Reliability Rank.)	Average % Error About the Mean Compared with True Measurement (Accuracy)	Average Total % Variability Range True Meas. (Reliability)
1. Metal Conformateur—Measurements taken Direct from Rods.	2	.31% Rank 1	.64% Rank 1
2. Wooden Conformateur—Measurements taken Direct from Rods.	7	1.21% Rank 4	1.04% Rank 3
3. Hard Wood Spinograph—Measurements traced on Blackboard.	7	1.42% Rank 5	.86% Rank 2
4. Soft Wood Pantograph—Measurements Traced to ½ Size on Long Paper and Multiplied by 2.	9	1.10% Rank 3	2.30% Rank 6
5. Hard Wood Pantograph—Measurements Traced to ½ Size on Long Paper and Multiplied by 2.	10	.54% Rank 2	2.34% Rank 8
6. Silhouette—Measurements Taken from Photograph by Determining Multiplier by Ratio of True Size to Picture Size.	11	2.92% Rank 7	1.32% Rank 4
7. Metal Conformateur—Measurements Reproduced from Silhouette as in Above Case.	14	3.22% Rank 9	1.34% Rank 5
8. Metal Spinograph—Measurements Traced on Blackboard by Automatic Pencil Holder Attachment.	15	1.60% Rank 6	2.45% Rank 9
9. Flexible Spine—Measurements Traced on Long Paper by Placing Instrument Flat.	15	2.99% Rank 8	2.33% Rank 7

VI. Reasons for Ranking—A Summary of Some Errors Observed

1. Possible Errors of the Conformateur

(a) Wide line caused if sticks are traced with chalk—error of .5 cm.
(b) Slight tendency to push subject.
(c) Wobble in rods.
(d) Space between sticks too wide—caused errors in vertical measurements.
(e) Square or blunt points cause slight error.
(f) Inability to mark exact points or to measure exactly.

2. Possible Errors of the Spinograph

(a) Tendency to push subject.
(b) Cannot trace the back exactly and smoothly.
(c) Slight wobble in instrument.
(d) Slight wobble in writing point holder.
(e) Inability to measure the tracing exactly.

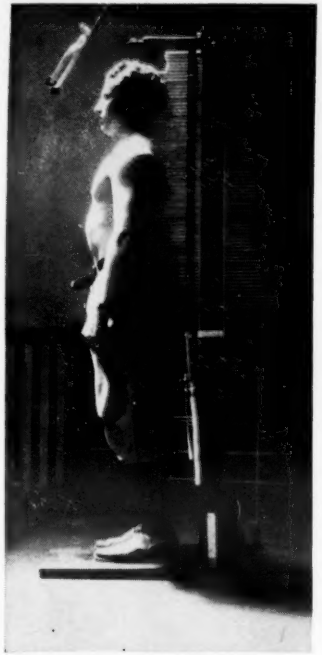
3. Possible Errors in Pantograph

(a) Using incorrectly calibrated multiplier or a multiplier which is not constant.
(b) Paper buckling or slipping while tracing.
(c) Writing point not vertical to surface of paper.
(d) Bending of instrument.
(e) Awkwardness of the instrument.
(f) Inability to measure the tracing exactly.
(g) The use of a multiplier causes a greater possibility of error.

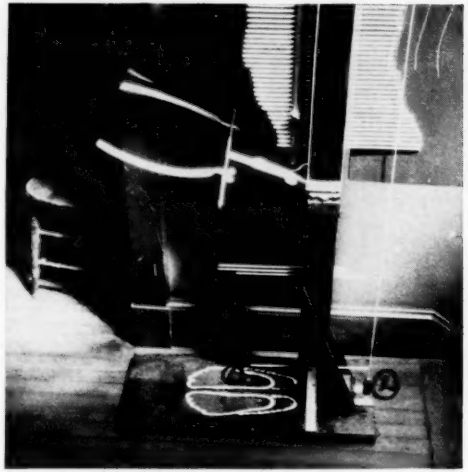
4. Possible Errors of the Silhouettograph Method

(a) The profile error. (Silhouette does not represent actual case).
(b) Difficulty in measuring the silhouettes exactly due to lack of sharply defined edges caused by improper adjustment of the lens or improper lighting.
(c) The smallness of the silhouette causes the likelihood of an error in determining the multiplier for the particular picture to enlarge the measurements to full size. Photographic enlargement causes delay and expense.
(d) Photographic errors due to maladjustment of the lens or the subject, such as,

1. Chromatic aberration—due to light dispersing properties of glass.
2. Spherical aberration—due to curved lenses, marginal rays refracted differently than center light pencils.
3. Coma—a special kind of spherical aberration—spherical aberration of the oblique rays.



SUBJECT IN PLACE



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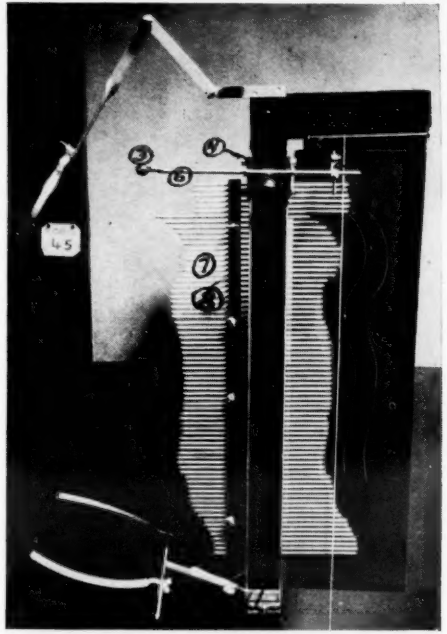

UPPER HALF

ILLUSTRATION V. THE NEW SPRINGFIELD POSTURE RECORDER

made by

T. K. Cureton and Walter Gunby
Dept. of Applied Physics and Animal Mechanics,
Springfield College, Springfield, Mass.

1. Rod used to locate the internal malleoli. 2. Plumb bob adjusted to end of rod. 3. Contact wheel for center of back. 4. Body of spinograph attachment. 5. Automatic pencil holder. 6. Sliding rod for spinograph attachment. 7. Cadmium plated steel rods—14 inches long. 8. Locking device for rods. 9. Demountable blackboard.

4. Curvature of Field—focal points of oblique and axial pencils in a curve rather than falling as on a flat plate.
5. Distortion—inability of the lens to reproduce a straight line as such.
6. Unequal illumination—diminution of intensity towards the margin of the field or over-exposure in the center with loss of detail.
7. Astigmatism—unequal refraction of the light pencils.

In this connection it may be pointed out that in determining the multiplier for the silhouettes a discrepancy was noticed between the result obtained by using lateral dimensions and the results obtained by using vertical dimensions:

Laterally

Length of Actual Rods (measured by vernier calipers) ..... 35.84 cm.
Reproduction by silhouette ..... 2.21 cm.
Ratio=16.217

Vertically

Overall length of the object between two sharp points ..... 90.68 cm.
Reproduced by silhouette ..... 5.61 cm.
Ratio=16.191

This difference accounts immediately for the possibility of a percentage error in the accuracy of the measurements of .308%. Whether the error is really in the lens cannot be said with certainty but the measurements were checked several times by independent observers with the same results. There is the possibility of a constant error of measurement made in the same direction by all examiners.

VII. A Recommended Procedure for a Minimum of Error and Maximum Economy of Time

Quantitative work of this kind, first with photographic errors then with the testing of various instruments as described, led to the development of a procedure which is believed to be the best adjustment to the case as far as the research has continued. It is not perfect by any means but, according to the evidence previously presented is the most accurate and most reliable of the methods tested. This involves the use of a new combination antero-posterior spinal measurement recorder constructed by Walter Gunby and myself in the Springfield Physics and Animal Mechanics laboratory. It has the following features:

1. A combination conformateur, spinograph and stadiometer.
2. Metal rods precisely machined to uniform length and proper diameter—plated with cadmium to prevent rusting—tapered ends.
3 Locking device which permits the rods to be clamped into position as soon as they are adjusted to the subject standing in a normal position. It may be pointed out that this eliminates the necessity for clamps of any kind because the measurements are taken from the ends of the rods which may be permanently fixed. While this is not necessary, due to the snug fit of the rods

in measuring the displacement of the ends directly, it is an invaluable procedure if the silhouette is to be taken of the entire set up. A subject cannot stand perfectly still for six seconds, slight twitches or movements causing erroneous borders. A series of trials taken consecutively shows that a subject varies considerably. The locking of the rods eliminates the necessity of clamping the subject and thus interfering with normal posture.

4. Clamps are provided as an aid in certain studies.
5. Rods at the bottom allow the location of the internal malleoli.
6. A plumb bob and line allow the curve obtained to be related to the internal malleoli as a point in the base of support. This is invaluable in studies of the effect of lean on the curves. The adjustable plumb line allows a vertical to be erected to any portion of the curve.
7. A levelling attachment to guarantee that the instrument is true vertically in relationship to the plumb line for antero-posterior measurements. The instrument may also be checked laterally by aligning the plumb line with the rods.
8. Holes are placed the entire length of the column to permit measuring a person of any size or the measurement of sitting posture. By an additonal hinge the board may be dropped lower to take these measurements.
9. Lends itself to being used in combination with the silhouettograph allowing a double check upon gross errors and the opportunity of obtaining quantitative results as well as the motivational picture.

Recommended Procedure

1. Adjust the subject in the combination conformateur by gently tapping the rods into place and locking them as the subject stands in the normal posture. The camera is located behind a partition 11′-0″ from the subject and apparatus. The apparatus and subject are 1′-0″ in front of the artist's linen. The lights are placed 45 cm. behind the screen and consist of a bank of 45 lights (25 watts per light—mazda type).[21] A time exposure of 4 seconds gives excellent results with the diaphram stopped down to 16 on the Century Penny Picture Camera furnished as standard equipment by the Eastman Kodak Co., Rochester, N. Y., equipped with a Betax No. 2 lens with Wollensak shutter. Bromide P.M.C. No. 1 sensitized paper is used directly without negative. The developing bath consists of two tubes of Eastman Elon Quinol Developer dissolved in 16 ounces of water at 65 degrees F. A washing basin intervenes between the developing basin and the fixing basin. The fixing basin contains a solution made from 1 pound of Eastman Kodak Acid Fixing Powder dissolved in 64 ounces of water. The procedure is to take the picture, develop it to desired intensity, wash it a few seconds and fix it a few seconds.
2. Trace the distal ends of the rods on the special blackboard carefully by using the special Eberhard Faber Co., Mongol 841 pointed chalk pencil. (This step may be omitted if a continuous curve is not desired.)
3. Adjust the plumb bob so that it passes through the point representing the 7th cervical vertebra (vertebra prominens)—it will probably be necessary to determine this point by asking the subject to drop his head forward slightly and feeling the spinous process with the hand. This point may be located and the rod corresponding to it pulled out slightly. Also, determine the posterior spine of the sacrum in a similar manner—by feeling and then pulling out the rod slightly which corresponds to its position. In succession and by shifting the plumb line to the right or to the left measure the distance

[21] The bank of lights as described gives a relatively even distribution of light, whereas, the single 1000-watt lamp and reflector gave an uneven distribution with consequent underexposure of the extremities or the plumb bob line.

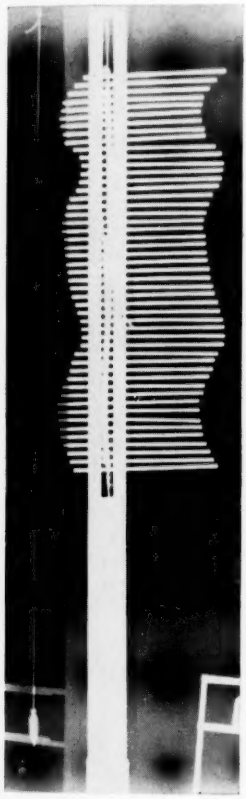

ILLUSTRATION VI. RESULT OF EXPERIMENTATION WITH LIGHTS FOR SILHOUETTE PICTURES

45 25-W lights. 25 cm. behind screen. 4 second exposure

ILLUSTRATION VII. NEW LIGHT BANK USED IN PREFERENCE TO SINGLE 1000-W. LAMP

Bank has 45 25-W lamps arranged to give even distribution. Mounted on beaver board painted with aluminum gilt

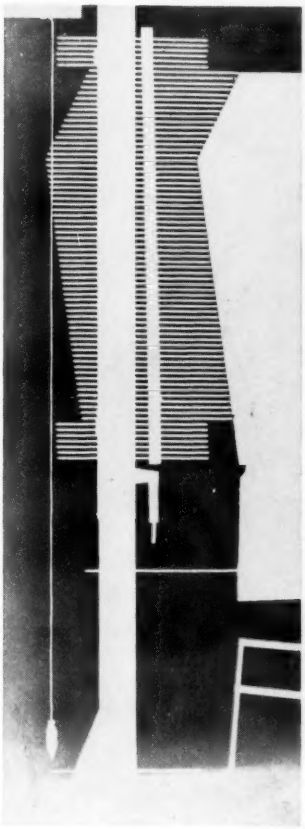

ILLUSTRATION VIII. RESULTS WITH SILHOUETTOGRAPH AND CONFORMATEUR

45 lights, 45 cm., 4 seconds.

by means of a steel rule graduated to millimeters from the plumb line in each case to the original line through the 7th cervical spinous process. This may be done by marking a small dot on the line at each of the desired points. determine the measurements at:

(a) The maximum thoracic curvature.
(b) The maximum lumbar curvature.
(c) The Displacement of the Posterior Spine of the Sacrum from the original vertical.

Note: This gives the alternative of taking the measurements directly as indicated or taking them from the silhouettes later. The former is preferable but in case the latter procedure is used it will be necessary to take the dimensions of some known distances on the subject or the instrument from which to determine the multiplier. The silhouettes may be enlarged and then measured.

Tests have shown that better results can be obtained without the use of the clamps.

VIII. Conclusion

This study has demonstrated some of the more common errors in measuring the antero-posterior curves of the spine. It indicates that the conformateur method is superior to other methods taken separately. A recommended procedure has been given calling for a combination scheme using the conformateur and the silhouettograph for best results. A series of 15 successive trials on a human subject using this procedure gave a result on the maximum thoracic curvature of $3.59 \pm .082$ cm. without the clamps and a result of $3.50 \pm .384$ with the clamps. This indicates that the procedure is better without the use of the clamps and that satisfactory accuracy can be secured for research on the many postural problems. Deviations in the spine can be measured with an experimental error as small as 1 per cent. The complete measurement can be made on each subject including the picture in two to four minutes.

The writer wishes to call attention to the fact that this study has been a cooperative research with Mr. Walter Gunby. The results as quoted in this paper have been obtained with his constant help. Mr. Gunby is conducting additional research along these lines. Dr. J. H. McCurdy has given many valuable suggestions from time to time. In fact, Dr. McCurdy has followed the progress of this study with constant helpfulness to Mr. Gunby and myself. It should be made clear that the summary only is included of the computations and results. The details will be included in Mr. Gunby's thesis to be completed at a later date.

Application of Psycho-Physical Method in Determining an Intramural Sports Program

Rudolf F. Vogeler
Supervisor, Intramural Athletics, University of Nebraska

THE Department of Intramural Athletics at the University of Nebraska was confronted with the following situation. An intramural program including sixteen sports was almost completed, but criticisms were being received that the program was too large, and that the various organizations on the campus were spending too much time on the athletic field. Since the beginning of intramural sports at this institution, no set schedule had ever been offered year after year. Some sports had been added and others dropped as facilities demanded. The problem at hand was to construct an intramural program of correct proportions and including those sports most desired by the competing organizations.

In reviewing the previous three years' records it was found that at some time or other in that period twenty-three sports had been offered. In fairness to the fraternities, by far the greatest supporters of our intramural program, it was decided to send them a questionnaire, allowing them to eliminate the undesirable or inappropriate sports.

The question now arose as to what method to use to accomplish this. To give all sports a fair chance in determining preferences, all those that had ever been used had to be included. Two possibilities presented themselves, namely, the rank-order method and the method of paired comparisons. In the former a number of samples, usually no more than ten, are arranged in order of preference, from most to least preferred. Since 23 sports had to be included the rank-order method was discarded, due to the fact that 23 samples would be too cumbersome to handle, plus the fact that the results would not be exact enough. The method of paired comparisons offered a better solution for our purposes. In using this method each stimulus is paired with every other one, a judgment of preference being made for each pair. Again we were confronted with the possibility that the questionnaire would become too involved and take too much time to answer.

Thanks to the kind suggestion of Dr. J. P. Guilford of the Department of Psychology of the University of Nebraska, a modified form of the method of paired comparisons was employed. Rather than pairing each factor with every other, three representative sports were selected with which to compare all others. One sport in which 25% of the organizations usually competed, one in which 50% usually competed and one in which 75% usually competed were determined through reference to the previous three years' records. Using these sports as standards each was paired with every one of the other twenty-two sports. In this way the number of pairs was reduced to 63.

The three sports chosen were water polo, hare and hounds, and boxing. The following were the instructions which headed the questionnaire:

"Check *one* sport of each of the following pairs to show in *which sport* you have the *least difficulty* in *obtaining men* to *compete*. For example, if you have less difficulty in getting men out for handball than for boxing, your decision would be checked as follows:

Boxing .....
Handball..X..

A DECISION IN EACH CASE IS NECESSARY"

This was followed by the 63 pairs of sports. The questionnaire was sent to the athletic managers of the various organizations. This manager is usually in a position to know the concensus of opinion regarding sports since it is his job to get the members of the organization interested in the program. To supplement this, however, each organization was urged to have as many of its members as possible voice an opinion in the organization's vote. Consequently, the 31 questionnaires returned, (79%) do not indicate merely 31 votes, but rather a great many more.

The results were tabulated as follows:

TABLE I

NUMBER OF PREFERENCES GIVEN TO EACH SPORT WHEN COMPARED WITH:

	Water Polo	Hare & Hounds	Boxing	Total	Percent
Handball	12	18	25	55	.591
Hard Ball Baseball	21	27	30	78	.838
Horseshoes	17	26	28	71	.763
Soccer	15	22	26	63	.677
Bowling	15	19	25	59	.634
Carnival Relays	11	18	24	53	.569
Basketball Free Throw	19	27	27	73	.784
Class "B" Basketball	22	26	30	78	.838
Swimming	8	20	25	53	.569
Water Carnival	7	14	23	44	.473
Wrestling	7	17	21	45	.483
Class "A" Basketball	29	30	30	87	.735
Playground Baseball	20	28	31	79	.849

Golf	19	23	28	70	.752
Indoor Track	12	21	25	58	.623
Tennis	18	24	29	71	.763
Outdoor Track	15	20	27	52	.666
Cross Country	6	9	23	38	.408
Rifle Shooting	7	17	23	47	.505
Volley Ball	14	23	26	63	.677
Water Polo	15.5	23	29	67.5	.725
Hare & Hounds	8	15.5	23	46.5	.500
Boxing	2	8	15.5	25.5	.274

The following steps were taken to determine the order of preference of all the sports listed:[1]

(1) Sum the number of choices each sport received.

(2) Find the average proportion for each sport, using the formula $\text{Av. P.} = \frac{\text{Sum of the Choices}}{93}$ (Denominator denotes 3 times the number of questionnaires returned.)

(3) Use Cattell's[2] table to find the scale values. (This is the table of the normal probability integral, giving the values on the abscissa which correspond to a given area under the normal distribution curve.)

After these scale values had been computed it was an easy matter to arrange them in order. This with the corresponding values was as follows:

TABLE II

ORDER OF PREFERENCE OF THE 23 SPORTS INCLUDED IN THE QUESTIONNAIRE

1st Class "A" Basketball	2.545
2nd Playground Baseball	1.530
3rd Hard Ball Baseball	1.460
4th Class "B" Basketball	1.460
5th Basketball Free Throw	1.167
6th Horseshoes	1.060
7th Tennis	1.014
8th Golf	1.009
9th Water Polo	.887
10th Volley Ball	.682
11th Soccer	.681
12th Outdoor Track	.637
13th Bowling	.508
14th Indoor Track	.465
15th Handball	.341
16th Swimming	.258
17th Carnival Relays	.258
18th Rifle Shooting	.041
19th Hare & Hounds	—.000
20th Wrestling	—.063
21st Water Carnival	—.101
22nd Cross Country	—.345
23rd Boxing	—.892

[1] Guilford, J. P., Psych. Rev., Vol. 25, No. 6, Nov. 1928.

[2] Cattell, J. McK. & Fullerton, The Perception of Small Differences, Pub. of the University of Pennsylvania, Phil. Series, No. 2, 1892.

Our problem still was not solved since we did not know how many of these sports were to be included in the new program. The next part of the questionnaire helped to solve this. The question was as follows:

"Does the present intramural program contain too many sports?———. If so, list below those which you would suggest be omitted?"

The results showed that 24 organizations thought the program too large while only 7 thought it to be adequate. Under the second part of the question 117 sports were listed. This total divided by 31, (the number of questionnaires returned) gave an average of almost 4, the number of sports to be omitted. As mentioned before, the program at that time contained 16 sports. Consequently, a 12 sport program was determined.

In the list of 23 sports which were considered it will be noticed that there are some analogous ones. From the standpoint of variety in the program it was inadvisable to include both sports in any of these pairs. Nevertheless, the organizations concerned were again given their due privilege to vote. The next question was stated as follows:

"Do you favor including in the intramural program both sports of the following pairs?"

(Hare and Hounds
(Cross Country .....Yes 3—No 28

(Class "A" Basketball
(Class "B" Basketball ..Yes 25—No 6

(Swimming
(Water Carnival .....Yes 6—No 25

(Playground Baseball
(Hard Ball Baseball ...Yes 10—No 21

These results show quite conclusively that only in basketball is there any desire for duplication. To supplement the original ranking of the sports, an additional check was made on the preference of one sport in each of these pairs. The statement with accompanying results follows:

"Check your preference of *one sport* in *each* of the following pairs:"

(Hare and Hounds	20	(Swimming	24
(Cross Country	11	(Water Carnival	7
(Class "A" Basketball	28	(Playground Baseball	16
(Class "B" Basketball	3	(Hard Ball Baseball	15

With the preceding data at hand it was a comparatively simple matter to determine the intramural sports program for the following year. Going down the list of our sports in their order of preference we find hard ball baseball in third place. But the subsequent data

prohibits the insertion of *both* hard ball and playground baseball, so the latter becomes the favored child. (The author wishes to say that he is very happy about this choice, not only because playground baseball is better adapted to our facilities but also because he thinks this sport is better for an intramural sport program than hard ball baseball.) The elimination of hard ball baseball advances each one of the following sports in our list of preference one place. For example, outdoor track in 12th now is in 11th place. But this sport is not on our program while indoor track, now in 13th place, is included! This departure was dictated through previous experience which showed that only a few freshmen track stars and sub-varsity men ever registered in the outdoor meet. This was due to the fact that the meet was run on an inter-collegiate basis. The indoor meet, however, with its shorter distances and point system for all performances was better adapted to our program. Consequently, the author, as the Supervisor of Intramural Athletics, took the privilege of substituting indoor track for the outdoor meet. Aside from this one change the whole program was decided upon by the competing organizations themselves.

The application of the modified form of the method of paired comparisons gave us a mathematically correct order of preference of sports which otherwise would have had to be determined by inaccurate opinions. The method is easy to use, and seems to appeal to the organizations concerned as revealed by the response obtained. In the final analysis, the university intramural athlete is just a play-loving boy who likes to have a voice in the choice of activity in which he indulges. A questionnaire of the type used served such a purpose, and resulted in a more efficient program to which a greater number than ever before responded.

A Classification of Completed Theses and Selected Subjects

Written by Students of Physical Education in Various Colleges and Universities in the United States, in Partial Fulfillment of the Requirements for the Degrees of Master of Arts or Master of Science

A. D. Browne, M. D.

Department of Physical Education, George Peabody College, Nashville, Tennessee

Resume of Survey

	Complete	Incomplete	Ed.	P.E.	Men	Women	Totals
1. Administration	30	6	10	26	25	11	36
2. Aquatics	9	3	3	9	6	6	12
3. Athletics	20	18	20	18	28	10	38
4. Athletics and Scholarship	14	0	12	3	3	9	14
5. Blind	2	0	1	1	1	1	2
6. Camp	5	2	4	3	4	3	7
7. Character Training	8	2	7	3	2	8	10
8. Citizenship	1	0	1	0	0	1	1
9. Comparative Studies	18	5	16	8	7	13	23
10. Corrective Gymnastics	15	2	4	13	11	6	17
11. Deaf	1	0	1	0	0	1	1
12. Delinquency and Vice	4	0	1	3	2	2	4
13. Dramatics	5	2	2	5	0	7	7
14. Educational Aspects	4	2	4	2	4	2	6
15. Extracurricular Activities	14	3	16	1	13	4	17
16. Growth and Development	11	1	6	6	8	4	12
17. History and Biography	8	6	5	9	5	9	14
18. Industrial	5	1	2	4	2	4	6
19. Legal Aspects	2	0	1	1	2	0	2
20. Leisure Time	6	2	6	2	2	6	8
21. Methods	9	3	7	5	7	5	12
22. Military Training	5	0	5	0	5	0	5
23. Physiological Aspects and Experimentation	53	13	22	30	13	39	66
24. Playgrounds	5	5	6	4	6	4	10
25. Posture	17	0	3	14	3	14	17
26. Prof. Training in Health and P. E.	14	3	10	7	9	8	17
27. Programs	30	1	8	18	11	20	31
28. Psychological Aspects	13	0	11	0	9	4	13
29. Religious	2	0	2	0	2	0	2

	Complete	Incomplete	Ed.	P.E.	Men	Women	Totals
30. Rhythmical Activities	24	10	7	27	2	32	34
31. Rural	6	1	3	4	3	4	7
32. Safety Education	4	0	2	2	2	2	4
33. Self-Testing	1	1	2	2	1	1	2
34. Surveys	54	7	46	15	45	16	61
35. Teaching of Health	13	0	11	2	5	8	13
36. Tests and Measurements..	57	2	30	29	16	34	59
TOTALS	492	111	302	278	296	319	599

Administration

A. COMPLETED THESES:

1. "The administration of a physical education program for girls in high schools not having gymnasiums, and an evaluation of a plan in use in Piedmont high school."
(P.E.)—University of California
2. "Gymnasium facilities as a factor in programming physical education."
(P.E.)—University of California
3. "The organization and administration of physical education."—Richardson, Violet (P.E.)—University of California
4. "Gymnasia." (P.E.)—University of California
5. "The administration and supervisory duties of heads of departments for high school girls."—Myers, Doris M.
(P.E.)—University of Southern California
6. "The administration of locker systems in the secondary schools of California."—Ramsey, Josephine Reid
(Ed.)—University of Southern California
7. "The evaluation of gymnasium equipment in terms of usage and cost."—Ayers, Gerald
(Ed.)—University of Southern California
8. "The administration of physical education in the large high schools of California."—Neilson, Neils Peter
(Ed.)—University of California
9. "The organization of the required physical education for women in state universities."—Ph.D. Johnson, Georgia Borg
(P.E.)—Teachers College, Columbia University
10. "Public school plumbing equipment."—Ph.D. Thomas, Minor Wine
(P.E.)—Teachers College, Columbia University
11. "School health administration."—Ph.D. Rapeer, Louis W.
(Health Ed.)—Teachers College, Columbia University
12. "Administration of extra curricular activities in secondary schools."—Chapman, Albert W.
(Ed.)—Teachers College, Columbia University
13. "A comparison of the regulations of state high school athletic associations." (Ed.)—Iowa University
14. "Curricular requirements in physical education in state universities."
(Ed.)—University of Minnesota
15. "Analysis of the administration and supervision of health education and physical training in various states."—Sackett, Everett B.
(Ed.)—University of Minnesota

16. "The municipalization of play and recreation."—Fulk, J. R. (Ed.)—University of Nebraska
17. "Recreation for all in the high school through better organization and supervision."—Ash, I. O. (Ed.)—University of Nebraska
18. "Investigations in connection with governmental procedures in the organization and administration of the leadership of physical education in cities in the United States with the object of establishing desirable trends."—Ph.D.—Nash, Jay B. (Ed.)—New York University
19. "Physical education in the 'child-centered' school."—Decker, Lois L. (P.E.)—New York University
20. "Physical education activities selected and adapted for college."—Judd, Leslie James (Ed.)—New York University
21. "A study of the trend in the construction and use of physical education facilities and in gymnasium construction in particular."—Winters, Art. (Ed.)—New York University
22. "Is there a place for a representative basketball team in a boys club?" —Kerwin, James E. (Ed.)—Notre Dame University
23. "Health education as part of a comprehensive educational program."—Selber, Norma (Ed.)—Ohio State University
24. "Annotated bibliography of magazine articles on big muscle play activities."—Crow, Elizabeth (P.E.)—George Peabody College
25. "An investigation of terminology in the field of physical education."—McDonough, Thomas E. (P.E.)—George Peabody College
26. "Public education in physical education."—Tenney, Rob (P.E.)—George Peabody College
27. "A correspondence course in the theory and principles of physical education."—Blackman, Alf. (P.E.)—George Peabody College
28. "Needed legislation for physical education."—Weinke, Ernest (P.E.)—University of Wisconsin
29. "Organization in American sport, 1875 to 1899, lawn tennis and golf." Wilson, Thomas (P.E.)—University of Wisconsin

B. Selected Subjects:

30. "The organization and administration of laboratory experience in teaching in the preparation of teachers of physical education."—MacNeil, John P. (Ed.)—New York University
31. "To find the average amount of space per school child under the department of education of the City of New York, which is being used for play activities."—Cranford, Chas. C. (Ed.)—New York University
32. "The organization and administration of recreation in Milburn, N. J." —Fox, John (Ed.)—New York University

33. "Principles governing the organization of a program of physical education activities according to interests and needs of children."—Cook, Marion I. (P.E.)—New York University
34. "Physical training as a profession."—Hipp, Thomas (P.E.)—George Peabody College
35. "Popularizing physical education in a community."—Berryman, Grace (P.E.)—George Peabody College

Men—21; women—9.

Aquatics

A. Completed Theses:

1. "The construction of a swimming pool based on the requirements of an educational program." (Ed.)—University of Arizona
2. "A study of swimming as a means of individual program adaptations in physical education." (P.E.)—University of California
3. "Hygiene at the men's swimming pool." (P.E.)—University of California
4. "Practical problems in swimming pool construction and supervision."—Clapp, Fred H. (P.E.)—University of Southern California
5. "Evaluation of types of formal swimming competition for girls of high school age."—Reichart, Natalie (Ed.)—University of New York
6. "Objective tests in swimming."—Cureton, Thos. K., Jr. (P.E.)—Y.M.C.A. College, Springfield, Massachusetts

B. Selected Subjects:

7. "A study of the effects of inter-collegiate swimming on the sinuses."—Livingstone, Alfred (Ed.)—University of New York
8. "Use of water as a play medium."—Blackman, Ethel (P.E.)—George Peabody College
9. "History and development of water play."—Willson, Zilpha (P.E.)—George Peabody College

Men—3; women—3.

Athletics

I. INTERSCHOLASTIC

A. Completed Theses:

1. "The administration and cost of high school interscholastic athletics."—Ph.D.—Wagenhorst, Lewis Hock (Ed.)—Teachers College, Columbia University
2. "How the evils of inter-institutional athletics may be corrected."—Pool, William T. (P.E.)—George Peabody College
3. "Uniform interscholastic high school athletic regulations."—Hunt, Robert L. (Ed.)—Colorado University
4. "Competitive athletics for womankind in the U.S."—Emde, Mrs. Laura (Ed.)—Teachers College of Akron University

B. SELECTED SUBJECTS:

5. "Critical analysis of inter-scholastic athletics in New York City."
(Ed.)—New York University
6. "A study of the financing of interscholastic athletics."
(Ed.)—New York University
7. "Valuating interschool athletics in a physical education program."
(P.E.)—George Peabody College
8. "Comparative expenditures on boys' inter-scholastic athletic activities in a selected list of high schools."
(P.E.)—George Peabody College

II. INTRAMURAL

A. COMPLETED THESES:

1. "Stimulating interest in intramural participation in the small college, (methods of)."—LeGanke, L. E.
(Ed.)—University of Michigan
2. "A program of intramural athletics in a trade school."—Scannell, John
(Ed.)—New York University

B. SELECTED SUBJECTS:

3. "A contribution of college intramural activities to post college recreational activities."—Bike, Ed.
(Ed.)—New York University
4. "Justifying the support of an intramural athletic program in schools and colleges."—Davis, Carl
(P.E.)—George Peabody College

III. ADMINISTRATION OF ATHLETICS

A. COMPLETED THESES:

1. "The extent and character of individual and group participation in sponsored and unsponsored athletic activities in seven Illinois high schools."—Miller, Don Waldo
(Ed.)—Chicago University
2. "The principle involved in the conduct of the athletic activities of girls and women."—Somers, Florence A.
(Ed.)—New York University
3. "The cost of athletics in two high schools."—Brown, Earl H.
(Ed.)—Lehigh University

B. SELECTED SUBJECTS:

4. "A study of coach's reactions to some of the problems of coaching."—Gross, O. M. (Ed.)—New York University
5. "The rise and development of the spectator's interest in athletics."—Hudspeth, Seth
(P.E.)—George Peabody College
6. "The study of the effectiveness of athletic events at the California State Teachers College Penn. in reference to carry over value."—Grove, Clarence Lester. (Ed.)—New York University

IV. BASKETBALL AND HOCKEY

A. Completed Theses:

1. "Effect of basketball on the health of high school girls." (Ed.)—Iowa University
2. "Correspondence course in the coaching of girls' basketball."—Perkinson, Gladys (P.E.)—George Peabody College
3. "The effect of coaching upon the acquisition of skill in the basketball free throw."—East, Ruby J. (Ed.)—Wisconsin University

B. Selected Subjects:

4. "The study of some effects of participation in field hockey and basketball by junior high school girls."—Mullan, Anne (Ed.)—New York University
5. "A statistical study of college basketball measured in terms of basket shooting."—Lash, Dale (Ed.)—New York University
6. "A discussion of the problems in basketball for girls."—Beasley, Mary (P.E.)—George Peabody College

V. FOOTBALL

A. Completed Theses:

1. "Analysis of positions of the body in game of football."—Faulkinberry, Frank A. (P.E.)—George Peabody College

B. Selected Subjects:

2. "Kinesiology of football."—Hogan, Young (P.E.)—George Peabody College
3. "A study of football."—Humphreys, H. C. (P.E.)—George Peabody College

VI. TRACK

A. Completed Theses:

1. "The kinesiology of track and field events."—Wohl, James F. (P.E.)—George Peabody College
2. "Practice in track and field events."—Barthold, Chas. W. (Ed.)—Temple University

VII. TENNIS

B. Selected Subjects:

1. "History and development of tennis."—Sims, Ophelia (P.E.)—George Peabody College
2. "Methods of teaching tennis."—Culbert, Kate (P.E.)—George Peabody College

VIII. BASEBALL

A. Completed Theses:

1. "Baseball as an educational means." (Ed.)—University of California

IX. ARCHERY

B. Selected Subjects:

1. "The history and development of archery."—Ellis, Dorothy (P.E.)—George Peabody College

X. MISCELLANEOUS

A. Completed Theses:

1. "The general athletic ability of college men."—Ph.D.—Cozens, Fred W. (Ed.)—University of California
2. "Analysis of highly organized athletic games."—Graham, Wynne B. (P.E.)—George Peabody College

B. Selected Subjects:

3. "Athletic injuries."—Mastin, Bob. (P.E.)—George Peabody College

Men—20; women—9.

Athletics and Scholarship

A. Completed Theses:

1. "A study of the scholarship of athletes."—McKale, J. (Ed.)—Arizona University
2. "Relation of physical condition to the intelligence and scholarship ratings of high school girls."—Bolch, Henrietta (Ed.)—California University
3. "Relationship between intelligence and accomplishments of sports and restricted physical education classes of high school girls." (Ed.)—California University
4. "A comparative study in terms of the teachers' marks of the scholastic records made by the male participants and non-participants in high school athletics."—Reist, Norman I. (Ed.)—Teachers College, Columbia University
5. "The grade and athletic abilities of university freshmen in the coaching course."—Rogers, Harold B. (Ed.)—Illinois University
6. "A comparison of grades made by athletes and non-athletes in high school."—Voltmer, Edward Frank (Ed.)—Iowa University
7. "Intelligence of athletes in Monmouth College." (Ed.)—University of Iowa
8. "Scholastic ability of athletic and non-athletic groups."—Anderson, Paul Nesbett (Ed.)—Iowa University
9. "The comparison of academic records made by varsity athletes of different sports." (P.E.)—University of Michigan
10. "Health, physical development and scholarship."—McClain, Margaret (Ed.)—New York State Teachers College
11. "Play activities and school marks."—Shikles, Gail (Ed.)—Kansas University
12. "A comparative study of the intelligence and scholastic achievement of athletes."—Bailey, Donald W. (Ed.)—University of Southern California
13. "The relationship between the mental achievements and accomplishments rankings of athletes and non-athletes in secondary schools."—Hall, Robt. T. (Ed.)—University of Colorado

14. "A study of the relation between health and school achievement."—McElwain, Maude E.
(Ed.)—University of Kansas

Blind

A. COMPLETED THESES:

1. "Physical education for blind girls."
(P.E.)—University of California
2. "The relation between manual dexterity and mentality of the blind."—Chapman (Ed.)—University of California

Camps

A. COMPLETED THESES:

1. "The organized camp; a discussion of the fundamentals, objectives, site, equipment, leadership, organization and program."—Morehouse, Lyman A. (Ed.)—Brown University
2. "Education and the summer camp."—Sharp, Lloyd B.—Ph.D.
(Ed.)—Teachers College, Columbia University
3. "The summer camp as an adjunct to the school systems."—McGowan, James W. (Ed.)—Notre Dame University
4. "The summer camp's contribution to health education."—Murphy, T. J.
(Ed.)—Notre Dame University
5. "Correspondence course of the principles of leadership in summer camps."—Horner, Cicely V.
(P.E.)—George Peabody College

B. SELECTED SUBJECTS:

6. "Resume of articles on activities in organized summer camps."—Leatherman, Cornelia
(P.E.)—George Peabody College
7. "Nature study through physical education."—Green, Blanche
(P.E.)—George Peabody College

Men—4; women—3.

Character Training

A. COMPLETED THESES:

1. "Possible contributions of curricular and extra curricular activities of senior high schools to character development."—Hubbard, Edith M.
(Ed.)—University of Southern California
2. "Moral education through physical education."—Hendrick, Loretta P.
(Ed.)—New York University
3. "Values of physical education activities as sources of character training."—Kissick, May S.
(Ed.)—New York University
4. "A study of character education with special reference to a survey and evaluation of the methods and procedures in use in a number of private and public organizations in the U.S."—Kaplan, Hyman
(Ed.)—New York University
5. "The development of leadership-followership as a part of character education in a school program of physical education."—Savage, Ruth
(Ed.)—New York University
6. "Sportsmanship in literature."—Downs, Mary
(P.E.)—George Peabody College

7. "Moral training through leadership of plays and games."—Cahoon, Ann (P.E.)—University of Wisconsin

B. SELECTED SUBJECTS:

8. "To study the possibility of reconditioning behavior disorders through physical education."—Edwards, Harry F.
(Ed.)—New York University
9. "An ethical evaluation of physical activities."—Steward, Mary L.
(Ed.)—New York University

Men—2; women—7.

Citizenship

A. COMPLETED THESES:

1. "Physical education for boys and its value for citizenship."—Hyacintha, Sister M. (Ed.)—Akron University Teachers College

Comparative Studies

A. COMPLETED THESES:

1. "A comparative study of physical capacities of the Filipino race."
(Ed.)—University of California
2. "The relationship between improvement in the health of high school girls and their improvement in scholarship."—Nichols, Marjorie P.
(Ed.)—University of Southern California
3. "A comparison of the physical characteristics of American, Japanese and Mexican school children."—Hyde, Helen Irene
(Ed.)—University of Southern California
4. "A comparative study of boys of Whittier State School and Monrovia-Arcadia-Duarte High School as to play information and athletic achievement."—Murray, Verl
(Ed.)—University of Southern California
5. A comparative study of health articles appearing in standard magazines for the year 1913, the year 1918, and the year 1928."—Weinstock, Esther (P.E.)—University of Southern California
6. "A comparative study of motor achievements of children of 5, 6 and 7 years of age."—Ph.D.—Jenkins, Lulu Marie
(Ed.)—Teachers College, Columbia University
7. "The physical efficiency of teachers; analytical study of some factors affecting the health and physical efficiency of public school teachers."—Ph.D.—Carrothers, George Ezra
(Ed.)—Teachers College, Columbia University
8. "Comparative Variability in Anthropometric traits of Normal and Feeble-Minded."—Ph.D.—Leiva, Louis A. Tireapegin
(Ed.)—Teachers College, Columbia University
9. "The comparative value of the American system of physical education and others—notably, the German and Swedish."—Lieb, Thomas J.
(Ed.)—Notre Dame University
10. "A comparative study of gymnastics and intelligence."—Wood, Elizabeth (Ed.)—Ohio State University
11. "An investigation into the educational cost of physical education as compared with English, History, Mathematics and Chemistry."
(Ed.)—Oregon University
12. "The relation of stature to physical ability."
(P.E.)—Oregon University

13. "A comparative study of representative athletic conferences."—McMurry, J. G. (P.E.)—George Peabody College
14. "The relation of physical training and literary training."—Benton, May L. (P.E.)—George Peabody College
15. "A comparison of the learning curves of two classes taught bowling by different methods."—Hafland, Synneva
(P.E.)—University of Wisconsin
16. "A comparison of the various tests of cardiac function."—Post, Julia
(P.E.)—University of Wisconsin
17. "Relation of thyroid enlargement to physical type."—Hupprich, Florence
(P.E.)—University of Wisconsin
18. "A comparative study of formal gymnastics and games for 7th and 8th grade girls."—Wolcott, Alta
(P.E.)—University of Wisconsin

B. SELECTED SUBJECTS:

19. "A comparative study of physical ability, physical achievements and athletic ability between Negro and White college women."—Baker, Mary E. (Ed.)—New York University
20. "A comparative study of physical education in New York City high schools for girls."—Marsh, Hadassah
(Ed.)—New York University
21. "A comparative study of the vital capacity of 200 normal cases and 200 deformed cases."—Greenwood, Edward D.
(Ed.)—New York University
22. "Comparative study and graphic presentation of the fundamentals and coaching schedules in the teaching of basketball."—Wachob, R.
(Ed.)—New York University
23. "The comparison of four major undergraduate girls' physical education curricula, in New York State, and their graduate placement."—Yend, E.
(Ed.)—New York University

Men—7; women—13.

Corrective Gymnastics

A. COMPLETED THESES:

1. "Corrective physical education in the state of California."
(P.E.)—University of California
2. "Phases of the corrective physical education movement with special reference to the work being done in the Los Angeles public schools."—Thompson, Olive W.
(Ed.)—University of Southern California
3. "Corrective physical education for groups; a text in organization, theory and practice."—Colestock, Claire
(P.E.)—University of Southern California
4. "The trends of corrective work in physical education in American colleges and universities."—Davies, E. R.
(P.E.)—University of Southern California
5. "Corrective gymnastics in an elementary school."—Barbee, Fred H.
(Ed.)—Kansas University
6. "A corrective program for men in the restricted group."
(P.E.)—University of Oregon

7. "The use of normal recreative activities in a corrective program." (P.E.)—University of Oregon
8. "A study of individual corrective activities in city schools."—Metcalf, Harlan G. (Ed.)—New York University
9. "Activities for children in orthopedic hospitals."—Hale, Virginia Ann (P.E.)—George Peabody College
10. "A study of short static contractions as an aid in a department of corrective and remedial gymnastics in universities and colleges."—Labree, Lawrence W. (P.E.)—Y.M.C.A. College, Springfield, Massachusetts
11. "Study of corrective work for college and secondary groups."—Gemme, Arthur L., Sr. (P.E.)—Y.M.C.A. College, Springfield, Massachusetts
12. "A study of the subcostal angle of four hundred college women."—Ihsan, Guzin (P.E.)—Wellesley College
13. "Physical defects of school children and methods of correction."—Muehl, Willard L. (Ed.)—University of Wisconsin
14. "The educational value of visual instruction in therapeutic gymnastics."—Praxl, Hannah (P.E.)—University of Wisconsin

B. Selected Subjects:

15. "Anatomical analysis of the feet with corrective games and exercises." (P.E.)—George Peabody College
16. "Preventive and corrective physical education by play activities."—Jessen, Paul (P.E.)—George Peabody College

Men—7; women—4.

Deaf

A. Completed Theses:

1. "Physical education in state institutions for the deaf."—Beattie, Mariette Sexton (Ed.)—University of Southern California

Delinquency and Vice

A. Completed Theses:

1. "Recreation and physical education as a preventive of juvenile delinquency and crime in the All Nations Boys Club."—Buss, Otto Earl (P.E.)—University of Southern California
2. "Relation of play to delinquency and vice."—Faulhaber, Marie H. (Ed.)—University of Nebraska
3. "The formation of a physical education program for delinquent boys." (P.E.)—University of Oregon
4. "The relation of play to juvenile delinquency."—Womack, Mamie (P.E.)—George Peabody College

Dramatics

A. Completed Theses:

1. "A study of dramatic play in groups of children from 2 to 5 years of age."—Oleson, Florence W. (Ed.)—Cincinnati University
2. "Costuming in dance drama." (Ed.)—Iowa University
3. "Pageants and festivals for secondary schools."—Sharp, Becky (P.E.)—George Peabody College

4. "Correspondence course in festivals and pageants for educational institutions."—Alexander, Mary Jane
(P.E.)—George Peabody College
5. "The development and presentation of a May Day Pageant."—Cheap, Mrs. E. (P.E.)—George Peabody College

B. SELECTED SUBJECTS:

6. "A study of costume for girls and women in physical education."—Benton, Alice A. (P.E.)—George Peabody College
7. "Methods of teaching festivals to elementary children."—Flinton, Emmeline (P.E.)—George Peabody College

Men—0; women—7.

Educational Aspects

A. COMPLETED THESES:

1. "The educational significance of physical training."—Staley, Seward
(Ed.)—Clark University
2. "The justification of physical education as a part of the high school program."—Moret, Fannie E.
(Ed.)—Tulane University
3. "An analysis of education objectives and outcomes in the field of health education."—Burkard, Wm. E.
(Ed.)—Pennsylvania University
4. "The place of physical education in the educational program."—Hershey, Katherine Frances
(Ed.)—Ohio University

B. SELECTED SUBJECTS:

5. "The relation of the cardinal principles of education to physical education."—Brame, Sidney
(P.E.)—George Peabody College
6. "Contributions of physical education to secondary education."—McDaniel, Monte (P.E.)—George Peabody College

Men—4; women— 2.

Extra-Curricular Activities

A. COMPLETED THESES:

1. "Extra-class activities."—Westby, Jas. M.
(Ed.)—University of North Dakota
2. "A program for correlation between boy scout activities and the junior high schools." (Ed.)—University of California
3. "An investigation to determine the desirability of extra-curricular activities in the high schools of California."—Knowles, Robt. R.
(Ed.)—University of California
4. "The organization, administration and financing of extra-curricular activities."—Bruce, Wm. Robt.
(Ed.)—University of Wisconsin
5. "Extra-curricular and curriculum activities."—Lindsey, R. V.
(Ed.)—University of Wisconsin
6. "A study of after school activities."—Koehler, Robt. H.
(Ed.)—Temple University

7. "The organized direction of boy's time within and without the modern high school."—Davis, Lyman K.
(Ed.)—University of Illinois
8. "A constructive plan for extra-curricular activities in junior high schools."—Sprenger, Florence H.
(Ed.)—University of Southern California
9. "Extra curricular activities."—Ellet, Lois
(Ed.)—Teachers College, Columbia University
10. "Relationship of certain social institutions in recreational functions."—Nash, Jay B. (Ed.)—New York University
11. "Extra curricular activities and grades."—McComb, Jesse E.
(Ed.)—Arizona University
12. "Extra curricular activities in Normal schools."—Earp, Leslie L.
(Ed.)—George Washington University
13. "The extra curricular activities in Missouri high schools."—Davidson, Robt. Lee (Ed.)—Missouri University
14. "The extra curricular activities of the junior college."—Grace, Sister Mary (Ed.)—Notre Dame University

B. Selected Subjects:

15. "Tricks and illusions for social entertainments."—McMillan, Covington
(P.E.)—George Peabody College
16. "A study of after school game activities."—Davis, R. I.
(Ed.)—New York University
17. "What is the history of the Boy's Club movement in America, and what are its sociological contributions?"—Greeley, J. Joseph
(Ed.)—New York University

Men—12; women—4.

Growth and Development

A. Completed Theses:

1. "The determination of data needed in the construction of a course in growth and development of the child."
(Ed.)—University of North Carolina
2. "A study of the mental and physical development of children under two years of age."—Pavey, Gertrude A.
(Ed.)—Ohio State University
3. "Mental and physical development."—Collins, Pryor E.
(Ed.)—Missouri University
4. "A study of the physical growth of children in McPherson, Kansas."—Potwin, Ross William
(Ed.)—Chicago University
5. "The significance of anatomical development in relation to certain educational problems."—Cook, Paul M.
(Ed.)—Chicago University
6. "Physical measures of growth and nutrition."—Johnson, Harry C.
(P.E.)—Y.M.C.A. College, Springfield, Massachusetts
7. "Physical growth and pubescence."—Thornly, Watson B.
(P.E.)—Y.M.C.A. College, Springfield, Massachusetts
8. "Exercise and physical development."—Martie, John Edward
(P.E.)—Y.M.C.A. College, Springfield, Massachusetts

9. "Seasonal increments of growth in weight according to age of grade school boys."—Tousley, Chas. Vernon
(P.E.)—Y.M.C.A. College, Springfield, Massachusetts

B. Selected Subjects:

10. "To study relationships between growth and nutrition and achievement in elementary school children."—Nelson, Mildred
(Ed.)—New York University

Men—7; women—2.

History and Biography

A. Completed Theses:

1. "The history of physical education in colleges for women."—Ph.D.—Ainsworth, Dorothy S.
(P.E.)—Teachers College, Columbia University
2. "History of physical education in public schools and colleges of the U.S."—Russell, Nellie E.
(Ed.)—Illinois University
3. "History of objectives of physical education."—Schutte, Fred
(Ed.)—New York University
4. "Physical education as practiced among the early Greeks and Romans."—Johnson, Ethel W.
(P.E.)—George Peabody College
5. "The social, religious and economic influences on the origin of the dance."—Barksdale, Rubie
(P.E.)—George Peabody College
6. "History of the development of physical education for women in Wisconsin."—Gorman, Gladys
(P.E.)—Wisconsin University

B. Selected Subjects:

7. "Historical trend of physical education for men in high schools since 1900."—Derochi, Primo Edmund
(Ed.)—New York University
8. "A study of the historic development of health and physical education in the public schools of New York City from its earliest beginnings to the present."—Freedman, George
(Ed.)—New York University
9. "Some contributions of the American Y.M.C.A. to physical education in Europe from 1918 to 1928."—Goss, Geo. E.
(Ed.)—New York University
10. "The history and development of athletics for women in colleges and universities in the U.S."—Knott, Gladys.
(P.E.)—George Peabody College
11. "The history and development of English dances and their place in the physical education program."—Miller, Mary Kate
(P.E.)—George Peabody College
12. "History of physical education in Texas."—Polk, Otto M.
(P.E.)—George Peabody College
13. "Rise and development of Christmas customs and festivals."—Bertha Jack (P.E.)—George Peabody College

Men—5; women—8.

Industrial

A. Completed Theses:

1. "Industrial physical education and recreation in factories of the San Francisco Bay cities."
(P.E.)—University of California
2. "Study of physical education and recreation in large industries in the South."—Boykin, Elizabeth
(Ed.)—New York University
3. "A study of the recreational activities of employed women."—Goetter, Bertha A. (Ed.)—Pittsburgh University
4. "Recreation in industry."—Phillips, Brucille
(P.E.)—George Peabody College

B. Selected Subjects:

5. "Physical education as applied to the vocational school."—MacCourt, George (Ed.)—New York University

Men—1; women—3.

Legal Aspects

A. Completed Theses:

1. "The legal provisions for health education."—Salisbury, E. Z.
(Ed.)—George Washington University

Men—1.

Leisure Time

A. Completed Theses:

1. "Students' use in leisure time of activities learned in physical education in State Teachers College."—Ph.D.—Saxman, Ethel Julia
(P.E.)—Teachers College, Columbia University
2. "Relation of promotion of recreation for boys in high schools to their use of leisure time."
(Ed.)—University of California
3. "Training for proper use of leisure time."—Shannon, Ethel A.
(Ed.)—Iowa University
4. "A study of the leisure time activities of the two year students in Indiana State Teachers College, in relation to the influencing factors with special reference to the activities offered by the Women's Athletic Association."—Hamblen, Malinda
(Ed.)—New York University
5. "Hobbies of a few professional men and women."—Mitchell, Claire
(P.E.)—George Peabody College
6. "Teaching the worthy use of leisure time."—McClain, D. A.
(Ed.)—Harvard University

B. Selected Subjects:

7. "Origin of women's interest in leisure time activities taken at one institution."—Simon, Florence A.
(Ed.)—New York University
8. "A study of the leisure time use of the games taught in the physical education program in fifth and sixth grades in the public schools of Yonkers, N. Y."—Speeley, Louise May
(Ed.)—New York University

Men—1; women—6.

Methods

A. COMPLETED THESES:

1. "A method of determining the objectives specific to a physical education course in high schools."
(Ed.)—University of California
2. "The scientific knowledge affording a basis for the intelligent control of bodily exercise."
(Ed.)—University of California
3. "An evaluation of the content methods and results of health education in the elementary schools of California."
(Ed.)—University of California
4. "Methods of teaching certain physical education activities for girls in secondary schools."—Atkinson, Ruth
(Ed.)—University of Southern California
5. "Motivating a physical education program for high school girls."—Hartley, Grace
(P.E.)—University of Southern California
6. "Procedures in physical education for women in college."—Gilkerson, John (Ed.)—University of Southern California
7. "The motivation of free exercises in the general gymnastic program."—Trieb, Carl (P.E.)—University of Southern California
8. "The place of physical education in secondary schools from the standpoint of school principals."
(Ed.)—University of Michigan

B. SELECTED SUBJECTS:

9. "Whole methods as against part method in the teaching of games in the 4, 5, 6 grades."—Jewitt, Helen L.
(Ed.)—New York University
10. "Survey of practice teaching procedures in physical education."—Pendergast, Helen A.
(P.E.)—George Peabody College
11. "The coaching of basketball."—Clauson, D. B.
(P.E.)—George Peabody College

Men—3; women—4.

Military Training

A. COMPLETED THESES:

1. "The advisability of military training in secondary training."—Mann, W. C. (Ed.)—University of South Carolina
2. "Military training in the high schools."—Sullivan, W. C.
(Ed.)—University of South Carolina
3. "Some aspects of physical education in relation to the War."—Batchelor, Wilber C. (Ed.)—Clark University
4. "History and present status of military training in land-grant colleges."—Garber, W. O.
(Ed.)—Illinois University
5. "The status of military training in American universities."—Chambers, Merritt M. (Ed.)—Ohio State University

Men—4.

Physiological Aspects and Experimentation

A. COMPLETED THESES:

1. "The growth of mentality through the effect of physical functioning upon mental functioning."
(Ed.)—University of California
2. "Effect of strychnine on reflex action."
(Ed.)—Iowa University
3. "Effect of immersion on cardiac activity."
(Ed.)—Iowa University
4. "The heart and exercise."—Morgan, Peter
(Ed.)—New York University
5. "A course of personal hygiene for college freshmen."—Messer, G. N.
(Ed.)—New York University
6. "The correlation of lung capacity of high school girls."—Wohltman, Gladys (Ed.)—New York University
7. "An experimental study of the development and measurement of health practices of elementary school children."—Gillis, Mary B.
(Ed.)—New York University
8. "The determination of physical efficiency in one test."—Fisher, C. J.
(Ed.)—Temple University
9. "The influence of age, weight and height per inch upon motor efficiency."—Zwarg, L. E.
(Ed.)—Temple University
10. "The influence of ten minutes of strenuous physical exercise upon heart rates."—Mortenson, Arthur L.
(Ed.)—Temple University
11. "The energy cost of track running and swimming."—Greene, Mack M.
(P.E.)—Wellesley College
12. "A study of the factors of physical endurance."—Espenschade, Anna S.
(Ed.)—Wellesley College
13. "The effects of certain drugs on the growth of albino rats."—Sullivan, Ruth M. (Health Ed.)—Wellesley College
14. "A laboratory basal metabolism apparatus."—Grout, Julia R.
(Health Ed.)—Wellesley College
15. "The kinesiology of the human foot."—Calvin, Ruth A.
(P.E.)—Wellesley College
16. "The 'metabolic cost' of a standard exercise: a study of women subjects of various ages, training and habits of living."—Collins, Vivian V.
(Health Ed.)—Wellesley College
17. "The physiologic and anatomic basis for the selection and limitation of women's motor activities."—Waterman, Emma F.
(Health Ed.)—Wellesley College
18. "Alkali reserve and hemoglobin as factors in fitness."—Taylor, Miriam
(Health Ed.)—Wellesley College
19. "The effect of exercise and fatigue upon resistance to infection. An experiment on the albino rat using pseudomonas aeruginosa."—Merrill, Ida Belle (Health Ed.)—Wellesley College
20. "Further evidence for decrementless conduction in narcotized region of nerve."—Rice, Lucinda
(Health Ed.)—Wellesley College

21. "A comparison of the effect of voluntary and compulsory training and sedentary living on resistance to infection."—Knauf, Florence
(Health Ed.)—Wellesley College

22. "The treppe phenomenon in mammalian skeletal muscle; an experimental study of its conditions and a discussion of its practical significance in muscular exercise."—Rice, Carol
(Health Ed.)—Wellesley College

23. "A study of the effect of exercise on the growth and bone development of albino rats on a diet deficient in vitamin D."—Port, Margaret
(Health Ed.)—Wellesley College

24. "The specific gravity of the human body; an approach to the analysis of body weight into muscle, fat and bone quotas."—Davies, Mary B.
(Health Ed.)—Wellesley College

25. "The 'physiological cost' of some of the activities used in physical education."—Rathbone, Josephine
(P.E.)—Wellesley College

26. "A study in bimanual erogography; the making of fatigue effects through variation in innervation."—Doupe, Mary S.
(Health Ed.)—Wellesley College

27. "The effect of vitamin D deficiency on susceptibility to infection."—Flint, Dorothy
(Health Ed.)—Wellesley College

28. "Reaction time with choice as an element of motor ability."—Gray, Louise F. (P.E.)—Wellesley College

B. Selected Subjects:

29. "A study of auditory anuity after exercise over a period of two months using a group of college girls participating in regular physical activity."—Wiesner, Theodora
(Ed.)—New York University

30. "A critical analysis of the physical examination of all under-graduate students of the department of education at New York University."—Evans, Ruth (Ed.)—New York University

31. "The effects of short and long periods of playing basketball upon the pulse and weight of senior high school girls."—Mitchell, Rose
(Ed.)—New York University

32. "Problem: to find the actual amount of playing time in a girls basketball game, and the physiological effects of the game."—Clark, Madeleine F. (Ed.)—New York University

33. "The history and theory of the accessory food factors with reference to certain problems in the field of physical education."—Lubowitz, N. R.
(Ed.)—New York University

34. "A study to determine some relationships of exercise and basal metabolism in three selected groups of college men."—Rogers, L. T.
(Ed.)—New York University

35. "Relation of anthropological measurements to strength measurements of college sophomore students in physical education."—Ierardi, T. G.
(Ed.)—New York University

36. "The effect of activity during the menstrual period upon fatigue: as measured by the ergograph."—Weiss, M.
(Ed.)—New York University

37. "A study of the relationship between skill in fencing and time reaction."—Ham, Laura
(Ed.)—New York University

38. "A study of the phylogenetic evolution of the shoulder girdle."—Patterson, M. R. (Ed.)—New York University

39. "A study of health status of college freshmen as indicated by entrance."—Krakower, Hyman
(Ed.)—New York University

40. "The evolution of the gluteal muscles."—Getmann, Clara E.
(Ed.)—New York University

41. "Weight index."—Quimby, R. C.
(Ed.)—New York University

42. "A further study in the training and conditioning of adolescent girls and adult women."—Berryman, Romayne
(P.E.)—University of Wisconsin

43. "Studies in the physiology of sleep."—Cantrill, Edna E.
(P.E.)—University of Wisconsin

44. "The effect of exercise on the tensile strength of connective tissues and on the weight of the heart."—Carrell, Lois; Ulrey, Margaret
(P.E.)—University of Wisconsin

45. "Relation of energy metabolism to degree of skill."—Cane, Hazel
(P.E.)—University of Wisconsin

46. "An investigation of the chances and sources of error in Borelli's method of determining the center of gravity in the human body."— Croskey, Marguerite (P.E.)—University of Wisconsin

47. "Effect of exercise on post operative convalescence."—Davis, Dorothy
(P.E.)—University of Wisconsin

48. "Good and bad aspects of modern American methods of eating."—Emery, Myra (P.E.)—University of Wisconsin

49. "Cardio-vascular reactions to correct posture."—Hall, Maurine
(P.E.)—University of Wisconsin

50. "Albuminuria following exercise."—Hellebrandt, Francis
(P.E.)—University of Wisconsin

51. "The effects of previous exercise upon the cardio-vascular reactions to exercise."—Hupprich, Florence
(P.E.)—University of Wisconsin

52. "An experimental study of beginning strokes in swimming for girls of college age."—McClanahan, Carolyn
(P.E.)—University of Wisconsin

53. "A roentgenographic study of respiration with special reference to the changes of position of the diaphragm in the different phases of respiration and in various positions of the body."—Mahaney, Florence
(P.E.)—University of Wisconsin

54. "A case study of problem swimmers."—Mahaney, Helen
(P.E.)—University of Wisconsin

55. "A study of training and conditioning of adolescent girls and adult women."—Robertson, Carita
(P.E.)—University of Wisconsin

Men—13; women—39.

Playgrounds

A. COMPLETED THESES:

1. "The development and influence of the playground movement in relation to the American youth."—Breese, Margaret Katherine (Ed.)—Boston University
2. "Correlation of school and playground."—Lorbeer, George C. (Ed.)—University of California
3. "The making of an outdoor play apparatus."—Humphrey, Louise G. (P.E.)—Teachers College, Columbia University
4. "A manual for the construction and equipment of school playgrounds." (P.E.)—George Peabody College
5. "Play for the needs of the child."—Bell, Martha Frost (P.E.)—George Peabody College

B. SELECTED SUBJECTS:

6. "An investigation into the conduct and financial support of playground and recreation activities in selected states."—Davis, L. W. (Ed.)—New York University
7. "Responsibility of the Board of Education and Recreation Commission in the promotion of play, physical education and community recreation." —Neal, Daniel (Ed.)—New York University
8. "A study of children attending a playground in Newark."—Pascal, Anthony (Ed.)—New York University
9. "A study of attendance of children between the ages of six and sixteen at certain playgrounds."—Woody, Loula (Ed.)—New York University
10. "History of playground movements."—Bell, Florence (P.E.)—George Peabody College

Men—3; women—6.

Posture

A. COMPLETED THESES:

1. "A study of short static strength of muscles in relation to posture of school boys."—Hughes, Robert Payton (P.E.)—Y.M.C.A. College, Springfield, Massachusetts
2. "A study of school posture and desk dimensions."—Bennett, Henry E. (Ed.)—University of Chicago
3. "A study of the relation of difference in posture to school success."—Caldwell, Alice (Ed.)—New York University
4. "The relation of athletic skills and strengths to those of posture."—DiGiovanna, Vincent (Ed.)—New York University
5. "The effect of costume on posture."—Reynolds, Miss Tommie (P.E.)—George Peabody College
6. "The objective evaluation of standards and types of posture."—Rawles, Harriet Post (P.E.)—Wellesley College
7. "The relationship between variations in the anteroposterior curves of the spine and scoliosis."—Frost, Loraine Hulbard (P.E.)—Wellesley College

8. "Chronological variations in the posture of children ages one to seven and ten to thirteen."—Maple, Katharine Norris
(P.E.)—Wellesley College
9. "An objective method of grading posture applied to girls of pre-school and elementary school age."—Wade, Clarice Norton
(P.E.)—Wellesley College
10. "A study of factors influencing the posture of school children."—Dennett, Frances Gorham
(P.E.)—Wellesley College
11. "Trunk strength and flexibility as factors in posture."—Powell, Mary E.
(P.E.)—Wellesley College
12. "An investigation into the causes of back pain."—Schnauber, Enid
(P.E.)—Wellesley College
13. "An objective method of grading posture."—MacEwan, Charlotte Genevieve (P.E.)—Wellesley College
14. "The value of swimming in the correction of scoliosis."—Anderson, Charlotte (P.E.)—University of Wisconsin
15. "The lumbar curve and its relation to age, weight, sex and general conditions."—Sameth, Elsa
(P.E.)—University of Wisconsin
16. "Study of the effect of improper footwear on the statics and dynamics of the foot."—Bartlett, Gertrude; Marks, Beatrice
(P.E.)—University of Wisconsin

Men—3; women—13.

Professional Training in Health and Physical Education

A. COMPLETED THESES:

1. "Physical education for the preparation of general elementary school teachers."—Ph.D.—Jameson, Emily Dean
(P.E.)—Teachers College, Columbia University
2. "The organization of professional training in physical education in state universities."—Ph.D.—Elliott, Ruth
(P.E.)—Teachers College, Columbia University
3. "Professional education of special men teachers of physical education in Prussia."—Ph.D.—Oktavec, Frank L.
(P.E.)—Teachers College, Columbia University
4. "The organization of professional training in physical education in Minnesota."—Elliott, Ruth
(P.E.)—Teachers College, Columbia University
5. "The organization of curricula for the training of women teachers in physical education."
(Ed.)—University of California
6. "Physical sciences as educational means with special reference to economic science."
(Ed.)—University of California
7. "The teacher of physical education for boys in California secondary schools."—Edwards, Paul D.
(Ed.)—University of California
8. "A study of the selection of prospective teachers of physical education." Harshberger, Edith Rodgers
(Ed.)—University of Southern California

9. "The minimum requirements in health and physical education for all teacher training courses."—McCreary, Aaron M.
(P.E.)—University of Southern California
10. "The training of high school physical directors in the state of California."—Dotson, George Edgar
(Ed.)—Stanford University
11. "Essential elements in a professional curriculum for the preparation of teachers and directors of physical education in a four year teachers college."—Zimber, Genevieve Catherine
(Ed.)—New York University
12. "The problem of professional training in physical education."—Small, Clare (Ed.)—New York University
13. "A job analysis of high school instructors of physical education."—Gower, Herman
(Ed.)—New York University
14. "A study of 108 colleges and universities preparing teachers in physical education in the U. S."—Milos Vejchoda-Ambros
(P.E.)—Y.M.C.A. College, Springfield, Massachusetts

B. Selected Subjects:

15. "A proposed four year professional course leading to a baccalaureate degree, with specializations in science and physical education."—Murray, Lillian B.
(Ed.)—New York University
16. "A study to determine the procedures used in professional schools of physical education to prepare students to perform the function of physical examination."—Morgan, Andres
(Ed.)—New York University
17. "Analysis of physical education programs of teacher training institutions."—Spooner, Dewey
(P.E.)—George Peabody College

Men—9; women—8.

Programs

A. Completed Theses:

1. "The minimum essentials in an adequate physical education program for high schools."—Smith, F. F.
(Ed.)—University of California
2. "A programme of physical education for senior high school girls correlating health and activities."—Ruben, Mabel J.
(Ed.)—University of California
3. "A study of play in the junior high school curriculum."—Farrell, D. O.
(P.E.)—University of Southern California
4. "A study of the physical education program for college women in America."—Hareld, Georgia B.
(P.E.)—University of Southern California
5. "A high school curriculum in physical education for boys."—Hindman, Darwin A. (Ed.)—University of Illinois
6. "The formulation of an athletic program for medium size high schools."
(P.E.)—University of Oregon
7. "A program of health and physical education for girls in New York City schools."—Baylis, Louise
(Ed.)—New York University

8. "A curriculum for a four year high school with an example of a method for planning a typical learning unit in health."—Jeter, E. V. (Ed.)—New York University
9. "Suggested and selected activities for a play program in a small West Virginia city."—Rogers, C. (Ed.)—New York University
10. "Program of physical education activities."—Robinson, H. D. (Ed.)—New York University
11. "Progression of physical education activities."—Bliss, J. G., Ph.D. (Ed.)—New York University
12. "A program of physical activities for high school boys."—Maddox, W. H. (P.E.)—George Peabody College
13. "A program of physical education for two-year normal schools."—Lane, Caro (P.E.)—George Peabody College
14. "A manual of physical education applicable to conditions in Oklahoma (elementary schools)."—Jones, Anna W. (P.E.)—George Peabody College
15. "Source material in community recreation."—Houchen, Grace (P.E.)—George Peabody College
16. "Modification of the higher organized games."—Ivey, Lenora (P.E.)—George Peabody College
17. "A physical training manual for Tennessee schools."—McDonough, Thos. (P.E.)—George Peabody College
18. "Plays and games of other nations and races."—Warren, Margaret (P.E.)—George Peabody College
19. "Girls' physical education program for Texas junior high schools."—Branon, Lorena (P.E.)—George Peabody College
20. "A program of physical training activities for elementary and high schools."—Yarbrough, Thelma (P.E.)—George Peabody College
21. "Physical education through an established program of incentives."—Crain, Nell (P.E.)—George Peabody College

B. Selected Subjects:

22. "A program of intramural activities for high school girls."—Norman, Evelyn (P.E.)—George Peabody College
23. "A suggested manual in formal gymnastics and individual athletic activities for the schools of Wisconsin."—Rasmussen, Edna (P.E.)—University of Wisconsin
24. "State manual of physical education."—Soller, Nina C. (P.E.)—University of Wisconsin
25. "A suggested manual of health education."—Wahle, Rhea (Ed.)—University of Wisconsin
26. "Proposed state athletic league for Wisconsin high school girls."—Kidwell, Kathro (P.E.)—University of Wisconsin
27. "Outline of physical training for beginners and primary grades."—Wittich, Walter (P.E.)—University of Wisconsin

Men—9; women—13.

Psychological Aspects

A. COMPLETED THESES:

1. "A study of the attitudes and ideals of adolescent boys."—Schwinn, Ed. A. (Ed.)—Akron University, Teachers College
2. "The psychological and educational significance of clubs."
   (Ed.)—University of California
3. "The psychology of learning applied to health education through biology."—Ph.D.—Laton, Anita D.
   (Ed.)—Teachers College, Columbia University
4. "Comparative psychology and hygiene of the overweight child."—Ph.D. —McHale, Kathryn
   (Ed.)—Teachers College, Columbia University
5. "An experimental investigation of the learning involved in ball tossing." —Wagner, Carlos J.
   (Ed.)—Illinois University
6. "A study to determine correlation between physical and mental proficiency, and the correlation between physical proficiency and leadership, and mental proficiency and leadership."—Cowans, R. E.
   (Ed.)—Kansas University
7. "Trait ratings of two groups of boys differentiated with respect to diversity of play interest."—Mickie, Obie Earl
   (Ed.)—Kansas University
8. "The influence of chronological age versus mental age on the play activity of boys."—Wilkerson, Doxey A.
   (Ed.)—Kansas University
9. "Psychological principles applied to motor learning."
   (Ed.)—University of Michigan
10. "The psychology of play."—Adams, F. F.
    (Ed.)—Nebraska University
11. "A social critique of current tendencies."—Willard, Dudley W.
    (Ed.)—Washington State University
12. "A study of the sex differences in mentality in the 5th, 6th, 7th and 8th grades of the Mississippi schools."—Powdermaker, Therese
    (Ed.)—University of Wisconsin
13. "The construction and uses of knowledge in physical education."—Strum, Arthur
    (Ed.)—University of Wisconsin

Men—8; women—2.

Religious

A. COMPLETED THESES:

1. "Physical and mental growth in relation to moral and religious education."—Heaton, K. L.
   (Ed.)—Boston University
2. "The development of play and its application in the program of religious education."—Engle, I. A.
   (Ed.)—Boston University

Men—2.

Rhythmical Activities

A. COMPLETED THESES:

1. "A study of the education values in natural dancing."—Gang, Blanche R.
   (Ed.)—University of Southern California

2. "The place of folk dancing in a program of physical education for elementary and secondary schools."—Shambaugh, Mary Effie (Ed.)—University of Southern California
3. "A study of the North American Indian dance and rites."—Sheffield, Sarah (P.E.)—George Peabody College
4. "Authentic folk costumes for folk dances."—Hill, Laura May (P.E.)—George Peabody College
5. "Application of the symbolism of color to the dance."—Hubbard, Sara (P.E.)—George Peabody College
6. "A classification of rhythmical activities."—Haddox, Clara (P.E.)—George Peabody College
7. "A study of the history of dancing."—Walters, Nelle (P.E.)—George Peabody College
8. "A program of rhythmical activities for junior and senior high school boys."—Hayes, Richard Francis (Ed.)—New York University
9. "Values of dancing in physical education."—Van Duyn, Marguerite (Ed.)—New York University
10. "The theory of the modern dance." (Ed.)—University of Oregon
11. "Rhythm in the pre-school education."—Flinn, Emma (Ed.)—Smith College
12. "Primitive motivations of the dance."—Guthrie, Phoebe A. (P.E.)—Teachers College, Columbia University
13. "A correlation of musical ability and dancing ability."—Stupp, Lillian (Ed.)—Wisconsin University
14. "A study in the relation between rhythm and co-ordinated movement."—Dillon, Francis (P.E.)—University of Wisconsin
15. "Practical application of fundamental dancing theories."—Fannin, Nina (P.E.)—University of Wisconsin
16. "A suggested manual of folk dancing for Wisconsin schools."—Lombard, Maude (P.E.)—University of Wisconsin
17. "A study in rhythm for the pre-school child."—Simpson, Dorothy; Watson, Geneva (P.E.)—University of Wisconsin
18. "Rhythmic analysis of dance composition."—Thielen, Katherine (P.E.)—University of Wisconsin
19. "An inquiry into the relation of the emotions to the dance."—Wild, Monica (P.E.)—University of Wisconsin

B. Selected Subjects:

20. "A study of the trend of dancing in teacher training institutions."—La Tourette, Charlotte (Ed.)—New York University
21. "The dance in art."—Brown, Irene (P.E.)—George Peabody University
22. "Dance composition and rhythmical analysis."—Moore, Miss Fritzie (P.E.)—George Peabody University

23. "A study of the characteristics of the people of various countries as portrayed through their dances."—Hayden, Alice
(P.E.)—George Peabody University
24. "The influence of Greek dances on modern dance."—Scroggin, Lucile
(P.E.)—George Peabody University
25. "Kinesiology of the natural dance for corrective purposes."—Roemer, Charlene (P.E.)—George Peabody University
26. "The history and development of English folk dancing."—Ireland, Mary
(P.E.)—George Peabody University
27. "History of folk and country dance with the technique and music of typical dances."—Norman, Evelyn
(P.E.)—George Peabody University
28. "The significance of costumes in the dance."—McWhorter, Elizabeth
(P.E.)—George Peabody University
29. "Combinations and multiplicity of combination as found in the dance."—Cornmesser, Mary Jane
(P.E.)—George Peabody University

Men—1; women—28.

Rural Education

A. COMPLETED THESES:

1. "A survey of the activities of adults in the rural community."—McGuffey, Verne (Ed.)—Colorado University
2. "Recreation of rural people."—Eells, H. L.
(Ed.)—Iowa University
3. "Smithdale and physical education; a study in rural health education and recreation."—Tripple, Mrs. Esther
(Ed.)—Massachusetts Agricultural College
4. "A physical education program for rural schools."—Jobe, Elsie
(P.E.)—George Peabody College
5. "Elementary school play activities for school with limited supplies."—Logan, Dorothy
(P.E.)—George Peabody College
6. "Physical education in the public rural school—Union County, Tenn., a special case."—Batey, J. S.
(Ed.)—Tennessee University

B. SELECTED SUBJECTS:

7. "Adaptation or modification of games of low-organization to the physical needs of school ground and school building."—Pressly, Polly
(P.E.)—George Peabody College

Men—3; women—4.

Safety Education

A. COMPLETED THESES:

1. "Safety education in the elementary school; a technique for developing subject matter." Ph.D.—Streitz, Ruth
(Ed.)—Teachers College, Columbia University
2. "Safety education and its application to the Boys Club."—Freeley, J.J.
(Ed.)—Notre Dame University
3. "A manual for safety education in elementary schools."—Hart, Ada B.
(P.E.)—George Peabody College

4. "Source material for training teachers in safety education."—Kevin, James (P.E.)—George Peabody College

Men—2; women—2.

Self-Testing

A. COMPLETED THESES:

1. "Self testing activities."—Williams, Durura M. (P.E.)—George Peabody College

B. SELECTED SUBJECTS:

2. "Sequence of movements in fundamental play skills."—Hill, Mabel (P.E.)—George Peabody College

Men—1; women—1.

Surveys

A. COMPLETED THESES:

1. "A study of the objectives in health education in the Akron high school."—Stanton, T. B. (Ed.)—Akron University Teachers College
2. "A study of the health of 17 year old pupils at Merritt and University high school (Oakland, Cal.) from the records of physical examination." (Ed.)—University of California
3. "An evaluation of the content, methods and results of health education in the elementary schools of California."—Hopper, Mary (Ed.)—University of California
4. "A study of the status and difficulties of homogeneous grouping of physical education classes for high school girls in California." (Ed.)—University of California
5. "The playground in its relation to the leisure time of the junior high school pupils seen by a survey of agencies for recreation in Fresno, California." (Ed.)—University of California
6. "The organization and administration of recreation in San Francisco Bay District." (Ed.)—University of California
7. "The status of physical education in the secondary schools of California." (Ed.)—University of California
8. "Administration of physical education in large high schools in California." (Ed.)—University of California
9. "The teacher of physical education for boys in California high schools." (Ed.)—University of California
10. "Health supervision in the Oakland, California, schools." (Ed.)—University of California
11. "Organized 'boys' work' in San Francisco." (Ed.)—University of California
12. "The present status of intramural sports in the Los Angeles junior high schools with special reference to boys' activities."—Hermle, O. B. (Ed.)—University of Southern California
13. "A survey of the records kept in girls' physical education departments in the secondary schools of California."—Thrall, I. R. (Ed.)—University of Southern California
14. "A study of the health work in the schools of Long Beach, California."—Anderson, Caloe Cas (Ed.)—University of Southern California

15. "Physical education in the Los Angeles city schools."—Polkinghorn, Rena (Ed.)—University of Southern California
16. "A study of the Arizona high school gymnasium and its uses."—Shumway, E. H. (Ed.)—University of Southern California
17. "The status of high school athletics in South Carolina."—Burke, S. F. (Ed.)—University of South Carolina
18. "Health education in the high schools of the U. S."—Heaton, W. M. (Ed.)—University of Colorado
19. "Our boys." A study of the 245,000 16, 17 and 18 year old employed boys in the State of New York.—Bierdge, H. G. (Ed.)—Teachers College, Columbia University
20. "A survey of recreation in relation to living conditions in Perryville, Ohio."—Clay, Mary (P.E.)—Teachers College, Columbia University
21. "The ventilation of school buildings."—McClure, J. R. (Ed.)—Teachers College, Columbia University
22. "Personnel study of directors of physical education for men in colleges and universities." Ph.D.—Scott, H. A. (Ed.)—Teachers College, Columbia University
23. "Physical education facilities for the public accredited high schools of Alabama." Ph.D.—Sharman, J. R. (P.E.)—Teachers College, Columbia University
24. "Physical education in the colleges of the United Lutheran Church in America." Ph.D.—Schott, C. T. (P.E.)—Teachers College, Columbia University
25. "A sanitary survey of the rural school plants of Warren, Kentucky."—Hatcher, Mattie L. (Ed.)—Chicago University
26. "Physical education in the schools of Chicago."—Copper, I. O. (P.E.)—Chicago University
27. "Health of the school and community."—Booth, L. M. (Ed.)—University of North Dakota
28. "Present status of health instruction in the 6, 7 and 8th grades in 30 selected cities of the United States."—Turner, Elizabeth E. (Ed.)—Emory University
29. "The status of physical education for girls in the high school."—Archer, Metta J. (Ed.)—Illinois University
30. "Physical education in the small high school."—Ray, G. V. (Ed.)—Indiana University
31. "The status of physical education and health in the high schools of Iowa."—Kohl, E. E. (Ed.)—Iowa University
32. "Status of physical education in Missouri." (Ed.)—Iowa University
33. "Status of physical education in Iowa." (Ed.)—Iowa University
34. "Study of curricula of professional schools and colleges of physical education."—MacNeil, J. P. (Ed.)—New York University
35. "Progress of physical education in the public schools of the U. S. during

the decade, 1910-1920, with special reference to legislation and curricula." —Jorgansen, Alberta W.
(Ed.)—New York University

36. "A survey and critical analysis of the existing adult Lay Leadership in 14 American play, recreation and physical education organizations."—Pritchard, E. A.
(Ed.)—New York University

37. "Recreational facilities to meet modern needs in a town of 10,000; based on a critical survey of the township of Milburn, N. J."—Bowell, R.
(Ed.)—New York University

38. "A health survey of East New York Continuation School."—Vierra, H. K. (Ed.)—New York University

39. "The status of physical education in Ohio."—Grueninger, R. M
(Ed.)—Ohio University

40. "Actual space facilities for physical education as prescribed by the Ohio school code, with special reference to Franklin Co."—Cobb, S. H.
(Ed.)—Ohio University

41. "Physical education in the high schools of the U. S."—Slager, F. W.
(Ed.)—Ohio University

42. "The status of the high school athletics coach in Ohio."—Bohn, J. E.
(Ed.)—Ohio University

43. "A study of health supervision in the schools of Oregon."—Keezel, E. L.
(Ed.)—Oregon University

44. "A study of school health work in Miami County, Ohio."—Vesper, C.W.
(Ed.)—Ohio University

45. "A physical education program for health conditions found in Peabody students."—Collins, Genevieve
(P.E.)—George Peabody College

46. "A survey of health conditions in Seattle grade schools with some educational implications."—Brethorst, Alice
(Ed.)—Washington State University

47. "A survey of health work and physical education in Wisconsin institutions."—Hales, Dorothy V.
(P.E.)—Wisconsin University

B. Selected Subjects:

48. "An analytical study of physical education in high schools of N. Y. (Boys)."—Schneider, Max
(Ed.)—New York University

49. "A survey of the present procedures in selecting the personnel to conduct the periodic physical (medical or health) examination in colleges." —Kauffman, E.
(Ed.)—New York University

50. "A survey of the procedure in the selecting of examiners to give the physical (medical or health) examinations in high schools."—Hebel, E.
(Ed.)—New York University

51. "The status of physical education in Sanitary District 180, New York City."—Griffiths, J. R.
(Ed.)—New York University

52. "A study of the present use of college stadia."—Clelamd, P. S.
(Ed.)—New York University

53. "Survey of physical education in Missouri before and after compulsory law."—Whiteman, C. M.
(P.E.)—George Peabody College
54. "A survey of physical education in the Germany of today."—Shannon, K. C. (P.E.)—George Peabody College
55. "The present status of physical education in the public schools of Wisconsin."—Basset, Gladys B.
(P.E.)—University of Wisconsin
56. "A survey of health work and physical education in Wisconsin institutions."—Hales, D. Virginia.
(P.E.)—University of Wisconsin
57. "The present status of physical education in the smaller schools of Wisconsin."—Hoffman, William
(P.E.)—University of Wisconsin
58. "A study of play and recreation in Dana county, Wisconsin."—Wann, Norman (P.E.)—University of Wisconsin

Men—44; women 14.

Teaching of Health

A. COMPLETED THESES:

1. "Subject matter in health education: an analysis and evaluation of the contents of some courses of study and textbooks dealing with health, and suggestion for using such an analysis."—Ph.D.—Strang, Ruth May
(Ed.)—Teachers College, Columbia University
2. "A study in the selection of subject matter in the field of health education."—Ph.D.—Lerrigo, Marion Olive
(Ed.)—Teachers College, Columbia University
3. "Personal hygiene for college students."—Oberteuffer, Delbert, Ph.D.
(Ed.)—Teachers College, Columbia University
4. "High school biology as a contributing factor in health education."—Lynch, Mary Elizabeth
(Ed.)—Boston University
5. "Health education in the public schools."—Cairns, Laura
(Ed.)—University of California
6. "A course of study in hygiene for senior high school girls."—Tomlinson, Edith S.
(Ed.)—University of Southern California
7. "Needs and practices in health education."—Chambers, Ralph S.
(Ed.)—Stanford University
8. "Health procedures in a boy's junior high school athletic program."—Willis, Walter.
(P.E.)—George Peabody College
9. "Hygienic living and health teaching in elementary schools."—Pinkerton, Herman (P.E.)—George Peabody College
10. "Health knowledge and health habits."—Swift, Margaret A.
(Ed.)—Teachers College, Columbia University
11. "A course in hygiene for a city normal school."—Dolfinger, Emma
(Ed.)—Teachers College, Columbia University
12. "Health problem sources."—Lerrigo, Marion Olive
(Ed.)—Teachers College, Columbia University

13. "The teaching of hygiene and sanitation."—DuPree, N. K.
(Ed.)—Texas University

Men—5; women—8.

Tests and Measurements

A. COMPLETED THESES:

1. "Investigation of the physical examination records of a group of college students as high school freshmen and as college freshmen."
(Ed.)—University of California
2. "The effect of an intensive course of localized exercise upon the chest development." (Ed.)—University of California
3. "Essential qualities in certain aspects of physical education with ways of measuring and developing the same."—Beall, Elizabeth
(Ed.)—University of California
4. "A study of the chest index of high school girls."—Berryman, Clara M.
(Ed.)—University of Southern California
5. "An experimental evaluation of certain objectives in physical education."—Sheue, Harry M.
(Ed.)—University of Southern California
6. "A study of the relation between mental and motor ability based on test of 180 eleven and twelve year old children of 49th St. Elementary school of Los Angeles."—Waite, Netta
(Ed.)—University of Southern California
7. "A method of finding the physical quotient and its relation to the intelligence quotient."—Quirk, William A.
(Ed.)—University of Cincinnati
8. "A minimum set of physical standards for children of school age."—Affleck, George B.
(Ed.)—Clark University
9. "Measuring motor ability; a scale of motor ability tests." Ph.D.—Brace, David K.
(Ed.)—Teachers College, Columbia University
10. "A scale for measuring." Ph.D.—Brownell, Clifford
(P.E.)—Teachers College, Columbia University
11. "Determination of the interrelations, partial and multiple between various anthropometric measurements in college women." Ph.D.—Boillin, Mary Louis (Health Ed.)—Teachers College, Columbia University
12. "Physical capacity tests in the administration of physical education." Ph.D.—Rogers, Fred R.
(Ed.)—Teachers College, Columbia University
13. "Blood pressure tests of exercise; basketball, track, field, barringer test."—Smith, Marguerite Lena
(P.E.)—Teachers College, Columbia University
14. "Measurement of skill in basket-shooting."
(Ed.)—Iowa University
15. "Measurement of performance in the one hundred yard dash."
(Ed.)—Iowa University
16. "Measurements of skill in playing tennis."
(Ed.)—Iowa University
17. "An objective test for evaluating physical activity, (wrestling and boxing.)" (Ed.)—University of Oregon

18. "Physical age—a test whereby this could be determined."
(Ed.)—Oregon University
19. "A physical ability test for classification purposes for college women."
(Ed.)—Oregon University
20. "The presentation of certain physical achievement measures of 50,000 boys and girls between the ages of eleven and eighteen in a number of communities in the U.S."—Atkinson, R.K.
(Ed.)—New York University
21. "An experiment in the measurement of physical efficiency."—Berkowitz, Morris (Ed.)—New York University
22. "A study of mental and physical measurements of College of the City of New York freshmen."—Berkowitz, Morris
(Ed.)—New York University
23. "Progression in physical education activities."—Bliss, James G.
(Ed.)—New York University
24. "A marking system in physical education for junior high school boys."—Clegg, Arthur
(Ed.)—New York University
25. "The establishment of procedures for an objective rating of girls in junior high schools."—Lyons, Sally
(Ed.)—New York University
26. "The learning curve basketball technique among high school boys."—Hitner, J. W.
(Ed.)—Temple University
27. "Relative importance of age, height and weight as contributing forces to physical achievement."—Kistmacher, John C.
(Ed.)—Temple University
28. "A study of the motor ability of junior high school students."—Huggins, Bernice (P.E.)—George Peabody College
29. "The relation of certain skeletal measurements to body weight in 500 college women."—Manchee, Marie
(P.E.)—Wellesley College
30. "A general athletic ability test for college women."—Lensch, Dorothea
(P.E.)—Wellesley College
31. "A study of the relation of certain skeletal dimensions to body weight in 1,030 women of college age."—Johnson, Marian March
(P.E.)—Wellesley College
32. "A cardiovascular test of fitness."—Poley, Margaret Susan
(P.E.)—Wellesley College
33. "The relation between various measures of mental and physical traits; academic standing and estimates of intelligence and height, weight, vital capacity, muscular strength, skill in gymnastics and sports, and general motor ability."—Halsey, Elizabeth
(P.E.)—Wellesley College
34. "A study of the feet of one hundred girls of college age with a critical analysis of subjective and objective methods of grading."—Arrowsmith, Miriam (P.E.)—Wellesley College
35. "Pelvic obliquity; its measurements and importance in physical efficiency."
36. "The relation of motor ability to that phase of mental ability concerned

in judgments of time, movement, distance, position, velocity and weight and to motor attitudes and associations."—Schleman, Helen B.
(P.E.)—Wellesley College

37. "The relationship between physical capacity and athletic ability among college women."—Kling, Virginia M.
(P.E.)—Wellesley College

38. "A standardized test for measuring the health knowledge of children in the elementary schools."—McLoon, Adelle M.
(P.E.)—Wellesley College

39. "A study of the factors conditioning the acquisition of skill in swimming."—Thompson, Betty L.
(P.E.)—Wisconsin University

40. "Correlation between different motor abilities."—Seen, Eva Marie
(Ed.)—Wisconsin University

41. "Tests and measurements in physical education."—Brownell, Mary Alice
(P.E.)—Wisconsin University

42. "The effect of distribution of practice periods upon the acquisition of skill in bowling."—Manchester, Gertrude
(P.E.)—University of Wisconsin

43. "A study in the acquisition of a motor skill tossing and catching balls."—Rosenhauer, George K.
(P.E.)—University of Wisconsin

44. "Items to observe in the supervision and teaching of games."—Saylor, Edith (P.E.)—University of Wisconsin

B. Selected Subjects:

45. "A study of the relationship between certain tests in physical education and athletic achievements."—Campbell, Loren
(Ed.)—New York University

46. "Tests for classification of college freshmen in physical education activities."—Campbell, Ann
(Ed.)—New York University

47. "A survey of existing methods of grading women in individual gymnastics classes in colleges and universities."—Noyes, Elizabeth
(Ed.)—University of New York

48. "The relationship of factors common to the Rogers strength test and the factors common to four track and field athletic tests for high school boys, using Spearman's formula for computing "g" and "S".—McCloy, Emma (Ed.)—New York University

49. "The device of an appliance and method whereby certain measurements of the human body can be obtained and recorded by a photographic process."—Hand, Earl
(Ed.)—New York University

50. "Comparison of types of students according to Roger's strength test."—Ireland, Mary J.
(P.E.)—George Peabody College

51. "Are our skilled girl athletes skilled because of infant pelvic girdles?"—Ellis, Flora May
(P.E.)—George Peabody College

Men—15; women—27.

BOOK REVIEWS

THE VITAMINS, by H. C. Sherman and S. L. Smith. The Chemical Catalog Co., Inc. 575 pp. $6.00.

This is an authentic and comprehensive book dealing with the history and latest developments in regard to vitamins. The information and bibliography is brought down to the middle of the year 1930.

According to the authors' statement, the first purpose of the book "is to present the knowledge available upon the . . . topic in a readable form, intelligible to those whose activities may be along a wholly different line," and a second purpose is "to promote research . . . by furnishing a well digested survey of the progress already made and by pointing out directions in which investigation needs to be extended."

The book fulfills its promise. It is written in language sufficiently technical to make it accurate and useful to those doing research, and yet it is not only intelligible to the average reader, but holds his attention with such interest that having once begun a chapter it is hard to put the book down until it is finished. It presents clearly what is known, and leaves one with the feeling of having been brought to the edge of the unknown with a clear and comprehensive knowledge of what has been discovered, but with no prejudices or preconceived ideas which might hamper his direction and interpretation of those facts yet to be observed or discovered.

Separate chapters summarize the history and present state of knowledge in regard to each of the recognized vitamins.

The bibliography of 182 pages is selected but comprehensive.

Because of the authors' expressed desire to make it of great practical value, it is especially complete in contributions more easily accessible in this country.

The Authors' index and the exceptionally carefully written subject index makes the book valuable and exceedingly usable as a reference.

Gertrude E. Moulton, M.D.,
Oberlin College,
Oberlin, Ohio.

SWIMMING AND WATER SAFETY, published by Boy Scouts of America, 1931, price 60c.

One of the decidedly valuable contributions made by the Boy Scouts of America is the series of handbooks, dozens of which have already been published. The one under review is the third edition of this publication, which was first issued in 1924 and again three years later. The present copy contains much new material and has distinct evidences of the influence of Fred C. Mills, the National Director of Swimming and Water Safety.

The volume under review treats primarily of various phases of watermanship in relation to camping, such as methods of teaching swimming at camp, strokes and training for races, diving, water front planning and safety, boat and canoe handling, drowning, causes, prevention, rescue methods and a chapter on pageants and water stunts, together with an appendix containing a series of questions and answers based on information in the text. There is a brief bibliography.

This is a splendid contribution and merits the closest study. It is eminently sane and comprehensive.

Questions may be raised with regard to several points. Can every healthy person float when his chest is inflated? (page 26). Experiments carefully controlled and thoroughly

checked by Dr. Karpovich of Springfield College seem to justify the conclusion that water in the lungs of drowned animals is the rule rather than the exception. (See foot note page 30). Directions for getting out of a canoe advise "put down your paddle first," and in the next sentence, "if your canoe should drift away sideways from the landing place, when you are trying to land, place the blade of your paddle flat on the water," etc. (Page 134).

Now the question may fairly be raised as to the wisdom of releasing the paddle before getting out of the canoe. The paddle may be placed along one gunwale and then the hand grasps paddle and gunwale, or it may be placed across the gunwales with the grip towards the landing side, then the paddles and gunwales are grasped by both hands in rising to the standing position.

Are muscle cramps most frequent in the calf and toe (page 156) or in the calf and sole of the foot (page 236, (26)?

These questions are some of those which occur to one in looking over the text, which is so meritorious that it seems almost unfair to even raise these issues, yet in the interest of truth and clarity it seems fair to do so.

G. B. Affleck,
Int. Y.M.C.A. College
Springfield, Mass.

OUR JOURNEY OF GROWTH. Book I, by Francis M. Walters, A. M., Sc. D. Heath and Co. 251 pp. $.80.

This book designed as a textbook to aid in health instruction in the elementary school, aims, as the author says in his preface, "to help in arranging programs of health instruction, direct the children in the formation of health giving habits and to keep them interested in their health and growth."

The book has been planned along the lines of positive health information. The facts given are scientific but in simple and readable terminology, within the understanding and reading capacity of an elementary school child. The illustrations are well chosen. They too stress positive health facts. Each chapter has a set of questions which sum up all the facts which have been presented.

One of the outstanding points of the book is the emphasis on mental growth and mental hygiene. He states some of the desirable mental habits as follows,

"1. Overcoming little fears of everyday life.
2. Performing simple duties and keeping promises.
3. Trying again when first efforts fail.
4. Cooperating with others when cooperation is part of the game.
5. Being honest under all circumstances."

The idea of stressing mental hygiene is most important and the facts and information given serve as guides which can be of great importance to the teacher who uses this book as a text.

The author points out the fact that individual instruction supplemented by health examinations and health talks is preferable to formal recitations as a means of health instruction. The information which he gives in this textbook is planned to serve as a basis of knowledge for the child in building up and keeping health habits and attitudes, which will carry on through life.

Marguerite Behrensmeyer,
Community School
Saint Louis, Missouri

HEAT AND HEALTH, by Morris Meister. Charles Scribner's Sons. 237 pp. Cloth. $1.08 per copy.

This excellent little book is designed to serve as a textbook in junior high school science and represents Book II of a four book series aiming to present a coordinated two year course in practical science. However, it is well enough written to interest adults and has numerous illustrations. Again, it is excellently adapted for use in con-

nection with elementary health and hygiene courses.

The contents have been selected with careful attention to the following major principles and criteria:

1. *Accepted major units of study* for junior high school science courses.
2. *Flexibility and thoroughness* attained by dividing the general series having to do with "Living in a World of Science" into smaller volumes which provides for a more adequate treatment of the subject..
3. *Objectivity* with which the units of subject matter can be taught.
4. *Adaptation to the ability* of younger pupils.
5. *Frequency of contact* in daily experience.
6. *Carry Over Value* for usefulness in adult life.

The text is extraordinarily well arranged for teaching and for motivation of the pupil. Each unit is approached by means of a story of biography or science fiction. Each chapter thus begins with several pages of very interesting reading of unusual human interest and succeeds remarkably well in awakening a desire to know more about the details. This process is still further promoted by the use of *problem pictures* to stimulate thought and desire for investigation. A variety of suggestions are made with each unit of material, of *things to do and make.* Review tests are provided with each chapter entitled "How Much Do I Remember."

The material is comprehensive and exceedingly practical:

Chapter I—*Sources of Heat*: Sun, friction, combustion, electric current, earth.

Chapter II—*Fuels and Fire*: Discovery, uses, oil, nature of burning.

Chapter III—*Uses of Fire*: body warmth, light, cooking, smelting, manufacturing, waste removal, explosives, destruction of bacteria, energy for machines.

Chapter IV—*Extinguishing Fires*: removal of fuel, lowering of kindling temperature, removal of air.

Chapter V—*Expansion and Contraction*: expansion and contraction of solids, liquids and gases.

Chapter VI—*The Thermometer*: essential parts, calibration, measurement of temperature.

Chapter VII—*Heat Conduction*: conduction by solids, liquids and gases.

Chapter VIII—*Convection and Radiant Heat*: convection currents in liquids and in air, radiation.

Chapter IX—*Heating Buildings*: use of open fires, stones, hot-air system, hot-water system, steam-heating system.

Chapter X—*Melting and Vaporization*: change of state, boiling, vapors.

Chapter XI—*Evaporization and Refrigeration*: cooling by evaporization, ice plants and refrigerators.

Chapter XII—*Solidification and Condensation.*

Chapter XIII—*Water and Health*: drinking, cleansing, water-sports.

Chapter XIV—*Air and Health*: warmth, moisture, circulation.

Chapter XV—*Guarding Against Health Destroying Germs*: size, reproduction of germs, diseases, prevention.

Chapter XVI—*The Fight of a City for Health*: water, laws, health measures.

This book should make a useful addition to any physical educator's library.

Thomas K. Cureton, Jr.
Int. Y.M.C.A. College,
Springfield, Mass.

THE POSITION OF THE FEET, A CONTRIBUTION TO THE HISTORICAL DEVELOPMENT OF FORMALIZING HUMAN LOCOMOTION, by Dr. Karl Gaulhofer. Printed by Gebruder Muller'sche Buchdruckerei, Kassel; copyright 1930 by Rudolph'sche the Verlagsanstalt, Kassel, Germany.

This monograph is the first of a series of "Publications of the Scientific Society for Physical Education" of which Dr. Karl Gaulhofer and Dr. Walter Schnell are the publishers. It endeavors to discover by historical investigation the cause of our present

method of standing, with the feet turned outward, and the rigid, straight line movements and positions peculiar to the Swedish and German free exercises of the past. Dr. Gaulhofer is the Austrian Supervisor of Physical Education and author of *Schulturnen* published in 1924 which is an exemplification of what Gaulhofer calls natural gymnastics (Naturliches Turnen).

The book is divided into seven parts. The first deals with questions as to what may be the cause of the formalized movements and positions, particularly prevalent in the Swedish and German gymnastics. The second deals with positions used by the early warrior; the third with the positions used by the fencer; the fourth with the dancer; the fifth with those of the gymnasts, particularly the Turners of Germany; the sixth with the position of the foot as it occurs in medical literature and from the point of view of the orthopedists and anthropologists; and, finally, there is a chapter devoted to conclusions.

Dr. Gaulhofer has gone to unusual sources for his information and thoroughly delved into the literature pertaining to the above chapters. He found that the position of the feet depended very much upon the activity involved. Tracing the origin of the angle position from its earliest appearance in literature, as far back as the 13th Century, its use by foot soldiers in military practice, its use in fencing and in dancing, the attitude of doctors as expressed in medical literature and of orthopedists and anthropologists, he concludes that all activities affected the habit of standing. Likewise the foot and body positions of the prevailing fashion had an effect.

In his conclusion Gaulhofer enumerates a number of positions and makes some classification as to their purposefulness and as to their significance. Artists have always objected to the accepted angle-position of the feet. The military people of today are not dictating our stand or walk. Dress also has always been an important factor in the daily habits of posture. Gaulhofer reminds us of the styles of 1890 as compared with those of 1930. Any effort to base the reasons for positions of the body upon social, military, and dancing customs narrows the conception of it. There should be no formalized standing position in physical education. The fact that fashion today dictates parallel position of the feet does not justify its use. Physical education adopts it because it is biologically correct, because it is purposeful and natural.

The book is profusely illustrated, showing the position of the various activities in their historical development. It has a table of contents and a bibliography given in footnotes but no index.

The book is highly recommended to students interested in the historical development of Physical Education.

Emil Rath,
Normal College of the American Gymnastic Union,
Indianapolis.

OUR HEALTH FOUNDATIONS, by Francis M. Walters, M.D. D. C. Heath & Co. 276 pp. 88c.

Dr. Walters needs no introduction to those familiar with "Physiology and Hygiene." His new book is agreeably less technical and he endeavors to follow what he characterizes as the trend away from anatomy toward that real hygiene which teaches how to live. The general method of presentation in each chapter consists of a simple statement of aim, exposition of subject matter, a paragraph summary of "facts learned," some questions largely of factual type, and occasional footnotes of explanation to teachers. In addition, at the end of many chapters, there is a "school and home section" intended to secure home cooperation, but the content does not make clear just how this is to be accomplished. These sections are, for the most part, suggestions to teacher or parent on pupil examination, exercises, health quizzes, how to take pulse, etc. There are several good classroom

demonstrations of a simple chemical laboratory nature which would arouse interest as well as illustrate, for example, that carbon dioxide does not support combustion, that gastric juices act chemically on foods, etc. In scope, the book covers the study of our principal life processes and individual hygiene; the emphasis is upon health and the way to build good body resistance; and the approach is to try to create the desire of the pupil to *do* and *have* the things which make for health. The treatment is quite simple and orderly, the text copiously illustrated, and while some of the diagrams are poor there are a number of excellent ones; e.g., illustrating lighting principles, nerve energy leaks, and a vastly improved "scheme of circulation." Your reviewer wishes that a revised edition might remove the antequated posture emphasis and breathing exercises and include many more pupil projects, though those used are good. There is much to commend the book for class use in Junior or Senior high schools in a field where most of the literature is too technical in language and emphasis for a course in the formation of habits of healthy living.

Evelyn B. Spindler,
Oliver High School,
Pittsburgh, Pa.

A Textbook of Hygiene, by J. R. Currie, M.A., M.D., D.P.H., M.R.C.P. William Wood & Co. 844 pp. $8.50.

I may say the general makeup of this text is a division into twenty sections (chapters), with an exhaustive index, one hundred and ten illustrations and forty-seven tables. It is prepared from the British point of view and contains at the end of each section the acts and orders in Scotland and England bearing upon the topic considered. Certain slight differences in point of view and phraseology are noted between typical American texts and this one by Dr. Currie.

The British regard the wet bulb as preferable to the dry bulb temperature as an indication of comfortable conditions of air. This seems quite reasonable since the skin is normally somewhat moist. The author in support of this point of view refers to the experience of Haldane and others whereby rectal temperatures arose with the wet bulb reading, while the discomforts by the workers bore no relation to a dry bulb record.

The forces in natural ventilation are stated as diffusion, wind movement, and inequality of temperature, while artificial devices are grouped into systems, namely, propulsion, extraction and balance. Comfortable room temperatures are placed considerably lower than in the United States, 65 to 66 degrees Fahrenheit with a fairly high moisture content, compared with four or five degrees higher as stated in this country.

Springs are spoken of as land springs and main springs, the latter being sources of large water bearing formations.

Despite the British reputation for bathing, the text calculates the daily consumption of water at much below the American allowance.

Naturally a good deal of space is given to industrial pollution of streams and methods of purification. It is gratifying to note that since 1862 in Scotland and 1923 in England and Wales, there has been prohibition against discharging into water containing fish any substances which would be injurious to the fish, their spawn or food. Recognition is made of the principle that the body is more than a heat engine and its food more than fuel, and on the basis of this idea the discussion of food places quite adequate emphasis upon the now recognized food accessories.

In section ten on personal hygiene are the characteristic statements "by all but the sick, the very young and the very old a cold bath fifty degrees Fahrenheit or lower should be taken daily." "The value of cold as a stimulus to metabolism is too little real-

ized." Vital statistics and particularly statistical methods are covered much more fully than in typical American texts.

One of the most satisfactory sections is that on meteorology and climatology. This shows perhaps more differentiation between the American and British points of view than does any other section. Fog is defined as atmospheric obscurity due to water particles and sufficient to render a standard object invisible at 1100 yards.

The National Health Insurance Act of 1911 is explained and evaluated and throws a good deal of light on the present British system of the "dole."

Generally the text is very satisfactory, printed in clear type, on a good grade of paper, and whenever possible is couched in non-technical terms, understandable and interesting to the laity.

G. B. Affleck,
Y.M.C.A. College,
Springfield, Mass.

THE SCHOOL FESTIVAL, by Adelaide Linnell. Charles Scribner's Sons, New York. 124 p. $1.25.

The author, a teacher of music at State Teachers' College, Mankato, Minnesota, has made a valuable contribution toward making the School Festival a worthwhile part of the educational program.

Miss Linnell points out the need for a revaluation of school programs and festivals to avoid the popular vaudeville conceptions and other ideals patterned after adult forms of entertainment and discusses the social and educational values based on the children's own interests and activities.

The author suggests many sources of material, gives helpful hints on costuming, selection of music, methods of work and outlines the development of a number of School Festivals that have actually grown from original material, children's own stories, ideas and experiences.

In keeping with these educational objectives, additional pages are devoted to the development of festivals built on legends and historical material which have been suggested by regular classroom activities. Festivals, promoting the feeling of international good will, are also included.

Throughout the book there is a very good bibliography.

This timely volume is thoroughly practical and will undoubtedly help and stimulate those interested in establishing educational benefits to children through the development and preparation of the School Festival.

A. S. Hotchkiss,
Supt. Division of Physical Education and Athletics, Tennessee Coal, Iron and Railroad Company, Birmingham, Alabama.

THE STUDENT WHO SMOKES, by Dr. J. Rosslyn Earp, published by The Antioch Press Company, Yellow Springs, Ohio, 1931. 63 pages. $1.00.

Dr. Earp's study of students at Antioch in relation to smoking, first published in 1926, was soon sold out. Persistent calls for the study resulted in a second edition in which has been included further study along the same line.

Smoking is considered in relationship to (1) Physiological effects; (2) Physical efficiency; (3) Scholarship and intelligence; (4) Earning power of users.

(1) Physiological effects. In relation to vital capacity the investigation considered the deviations calculated from the rather discredited Dreyer formula, and finds there is no significant difference between smokers and non-smokers. Pulse rate in the two classes is almost identical. The systolic blood pressure in the horizontal and the mean pulse rate in the horizontal are both slightly higher in the non-smokers. The mean of the pulse rate after standard exercise indicates that the non-smokers increase 48.4 beats per minute as compared with 47.6 for smokers.

(2) Physical efficiency. Basing his conclusions on performance (athletic letters, points won in track meets,

etc.) the author finds presumptive evidence that "habitual smoking is detrimental to the greatest physical efficiency."

(3) Scholarship and intelligence. Scholarship of the non-smoker is somewhat higher but the intelligence tests indicate a slight superiority on the part of the smoker, leading the author to the conclusion that "the smoker who can enter and remain at Antioch must compensate by a slightly higher average intelligence for his lower average scholarship." More significant is the study of the progressive scholarship during the three consecutive years. Here is the conclusion reached—"On the average, thirty-five men who smoke are poorer scholars in 1925 than they were in 1922. There has been no significant change in the average scholarship of thirty-nine non-smokers during the same period."

(4) Economic aspect. Comparing the wages actually earned by the two groups during their alternate periods in industry (a plan followed by Antioch) Dr. Earp finds—

	Weekly Wage	
	Smokers	Non-smokers
Freshmen	$21.20	$21.20
Sophomores ...	21.63	22.79
Up. Classmen ..	23.67	24.84

This slight difference of $1.17 in favor of the non-smokers has only slight statistical significance.

Accepting the author's findings at their face value, there remains the question as to the extent (if any) to which smoking is a cause of the differences noted. Other investigators have found that certain groups, for example the athletic, are more prone to smoke than others, and that the difference in their performance or scholarship may not be directly traceable to smoking. Dr. Earp recognizes this possibility, but yet feels on the basis of his investigations that smoking is definitely related to his findings.

G. B. Affleck,
Int. Y.M.C.A. College.

THE ESSENTIALS OF SWIMMING POOL SANITATION, by C. A. Scott, B.P.E. Lightner Publishing Corporation. 126 pp. $1.00.

In reading Mr. Scott's book on the swimming pool the suspicion came to us that he had at various times looked for information on the care of the swimming pool and had not been able to find it. Otherwise how could he have put so many of the rarely covered yet essential points in swimming pool sanitation into one book.

His use of terms suggests also that the usual terminology has at various times confused him. At any rate he has succeeded in putting into ordinary language most of the scientific terms which otherwise would prove difficult for the average swimming pool operator to understand.

That the book contains the essentials for the care of the swimming pool and that the theories back of the various practices are discussed so accurately without the use of terms difficult to understand ought to make this work very valuable to those in charge of swimming pool sanitation and yet have not had any instruction in sanitary hygiene.

H. A. Rice,
Instructor in Chemistry and Bacteriology,
Y.M.C.A. College, Chicago.

EXPRESSION-GYMNASTICS, by Dr. Rudolph Bode. Translators Sonya Forthal and Elizabeth Waterman. (Illustrations printed from German Plates). A. S. Barnes. 171 pp. $2.00.

Emphasizing the "art of movement," rather than solely the dance or sports, and yet standing midway between the two, Bode develops a human being totally integrated physically, mentally, and spiritually. The individual's right to his own rhythm, which though not imposed by the group may yet be evolved through group action, and an emphasis on the performance of exercises in the upright standing position distinguish the Bode system of Physical Education from other types.

"The larger the swinging mass," says Bode in speaking of group work, "the stronger is the natural influence, and the more powerful are the vibrations of the soul. This is the significance of the choruses in the Greek Tragedies. They were rhythmically moved, and metrically organized, and fascinated every one by their spiritual expression. Only by group teaching do we avoid the great danger of gymnastics degenerating into the cult of the ego." (page 48).

Rudolph Bode in bringing his "Rhythmic-Gymnastics" at a crucial time to the German youth emancipated them from the subjection of formal gymnastics. He initiated and carried along with his enthusiasm a reaction to the slump and depression into which Germany had fallen after the World War, performing the same patriotic function that Father Jahn had achieved after the Franco-Prussian War. Bode fired the German youth with a desire for free expression and harmonious co-ordination of body and soul.

Sonya Forthal, formerly Director of Physical Education at the Illinois State Teachers' College, Macomb, Illinois, and Elizabeth Waterman, Director of Physical Education at the Illinois Women's Athletic Club, have both observed Dr. Bode's work first hand. Miss Forthal spent a year in Europe making a survey of the schools in Vienna,[1] and attending as a visitor the Physical Education classes in the Universities of Vienna and Berlin. Observing the beautifully unified movements of Bode's pupils at the University of Berlin, and the totality of expression as the movements initiated in the trunk musculature permeated the various parts of the body, Miss Forthal determined to translate Dr. Bode's book. When she returned to America she asked Miss Waterman to assist her. After Dr. Bode's permission was secured, the A. S. Barnes Publishing Company had agreed to publish the book, and the translation was begun, Miss Waterman visited the Bode School at Munich during her summer vacation. Miss Forthal and Miss Waterman are by training and practical experience qualified to present this translation.

Olga Anderson Buhl,
(Formerly of the University
of Wisconsin)

[1] "Physical Education in Vienna" by Sonya Forthal appeared in the American Physical Education Review, April, 1928.

WHAT EVERYONE SHOULD KNOW. By Oliver T. Osborn, M.A., M.D., F.A.C.P. Charles C. Thomas. 329 pp. $2.50.

On the whole, the author has made a worth while addition to the flood of texts on personal hygiene. The subject matter is plainly stated and the use of technical words has, for the most part, been very successfully avoided. It has the rare quality in a text of this sort of making statements in an interesting way so that it is entertainingly readable.

The content has been divided into such units as growth and development; functions of the body; nutrition; food; diet; promotion of health; infection; prevention of disease; etc. Some twenty pages are devoted specifically to the child covering such factors as the examination of the preschool child, schools, school hygiene, and the feeble-minded and backward child.

In the chapter on "Promotion of Health" the first section—that on "Health Axioms"—gathers together a considerable amount of valuable briefly stated material. However, some of the author's conclusions concerning the harmful effects of the use of tobacco by girls and women seem hardly supportable by scientific or statistical evidence. Dogmatic statements are made without limitation that are far from scientific. For instance, "The use of tobacco by the mother during pregnancy and lactation is harmful to the child." One might ask how much tobacco, and at what time during pregnancy and lactation.

On page 257 the statement is made, "There can be no question of the harmfulness of young mothers smok-

ing either during pregnancy or lactation." Until such a statement can be proven, it should not be made, since without proof there is considerable question. Further on, "Young girls have not been smoking long enough for a study to be made of the effect on their school work." How long must they smoke before school work would be affected?

On page 258, "There must be some positive reason why a habitual cigarette smoker always desires the brand to which he is accustomed, and is not satisfied with any other brand." Why the innuendo? Most persons who use coffee prefer a particular brand of coffee; candy eaters are likely to prefer a particular manufacturer's output. Does it necessarily follow that deleterious substances have been added?

In conclusion, the reviewer would like to state that a writer cannot be too careful in making dogmatic statements which would seem to be based more on prejudice than on scientific provable facts. The reviewer has no defense of the use of tobacco to make. He does, however, question the advisability of placing loose statements before a group of students, since those statements tend to perpetuate the same type of loose arguments that make up most of the propaganda against many factors of American life to which individuals or groups may object.

Charles H. Keene, M.D.
Professor of Hygiene,
University of Buffalo.

MIND-BODY RELATIONSHIPS. Interpretations of Physical Education, Volume I. Edited by J. B. Nash, Ph.D. A. S. Barnes & Co. 276 pp. $2.00.

The mind and body constitutes an inseparable unit. Scientific investigations and practical experience indicate the impossibility of a separation of mental and physical activities if we are to realize desirable outcomes in our physical education program,—thus may be summarized the predominant theme, permeating the various contributions presented in "Mind-Body Relationships."

The book is a collaboration of sixteen authors including the editor, under the editorial supervision of Dr. Jay B. Nash, chairman, Department of Physical Education, New York University. The volume was developed from a "Symposium on Physical Education and Health" at New York University in March, when the material constituting the basis for this book was presented by the various authors.

In the introduction Dr. Nash interprets physical education. He defines it as education that "concerns itself with the organization and administration of vigorous total body or big muscle activities." The sources, causes, and results of purposeful physical activities are stressed. Dr. L. V. Lyons, attending physician of the Neurological Institute and lecturer on neuroanatomy at New York University, contributes to the introduction a discussion emphasizing the oneness of mind and body.

Part two deals with life as a biophysical organism. Dr. E. C. Schneider who is Professor of Biology and head of the Department, Wesleyan University, Connecticut, describes the living organism as an adaptable machine. Some relations between early physical and mental growth are then pointed out by Dr. Arnold Gesell, Director of the Yale Psycho-Clinic. He states that the "individual grows as a unitary whole."

In part three, life and the body as a bio-chemical mechanism is discussed by three contributors. Mr. Jerome Alexander, who is author of several volumes relating to colloidal chemistry, stresses the importance of developing a physical education program resulting in a sound mind in a sound body. M. E. Little, Assistant Professor of Physical Education in New York University, summarizes results from many notable research chemists. He states that "this evidence from genetics, from embroyology and from physiology, all points in one direction: toward the chemical and physical basis of life." The discussion is continued by Dr. Robert Chambers,

Chairman of Biology in the Washington Square College, New York University. He raises the question as to whether or not the body is a biomechanical mechanism.

Health as an integration of the living organism is the title of part four. Both Dr. C. I. Lambert, Chief of the Psychiatric Department, Columbia University, and Miss Marguerite M. Hussey, Advisor in the School of Education, New York University, discuss this topic. Dr. Abby H. Turner, Professor of Physiology at Mount Holyoke College, then raises the question as to the possible effects of physical soundness upon college success. She presents data relative to vital capacities of college women. While she considers her findings inconclusive, they indicate positive correlation between high vital capacity and success in the various phases of college work.

In part five, three writers discuss the development of character. Dr. Louis Berg, who is attending physician at the Beth David and Out-Patient Department of the New York Post Graduate Hospital summarizes the contributions of various authorities showing definite relationships between the physical "constitution" and "personality." Dr. W. H. Burnham, author of "The Normal Mind" and other writings, discusses the development of wholesome personality. Prof. Frank S. Lloyd of the Department of Physical Education, New York University, then points out some of the opportunities for character education through physical education.

Part six treats the topic of leisure time. The relationship of physical education to art is positive and real according to Dr. Robert Tait McKenzie, Director of the Department of Physical Education, University of Pennsylvania. Mr. John Collier, an author of note in the field of social science, contributes an article stressing the need of individuals for securing fullness of life through wholesome use of their leisure time.

Dr. Shailer Upton Lawton, Director of Health Service, New York University, contributes part seven. This chapter is devoted to a discussion of physical education as a profession. He points out the splendid challenges and some of the hazards of the new profession.

Dr. Jay B. Nash, Director of the Department of Physical Education, New York University, concludes the series of stimulating articles by a chapter dealing with the administration of health and physical education, constituting part eight. He emphasizes the need of measuring theory by successful practice. He sets up definite standards of some of the important administrative activities in the field.

While the book evidences some lack of coherence as would be expected in such a symposium, it is sound, stimulating, and altogether much worthwhile. It stresses the need for consideration of the total human being as an integral whole. It emphasizes the necessity for cooperation of scientists, recreation directors, and educators in all fields in dealing with supervision of the development of human beings. It is an important contribution to physical welfare literature.

Willard Walter Patty, Ph.D.
Director of Physical Welfare Training, Indiana University.

NATURE AND SCOPE OF EXAMINATIONS. Interpretations of Physical Education, Volume II. Edited by Jay B. Nash, Ph. D. A. S. Barnes & Co. 307 pp. $2.00.

This book is the second in the series of Interpretations of Physical Education. Those familiar with the first volume, "Mind-Body Relationships," will find in this second volume a valuable continuation of the interpretations.

As the editor states, the book is intended to present the various types of tests, examinations and procedures which are necessary to determine the condition of an individual so as to protect him and society, and at the same time establish a basis for educational guidance. Twenty-five experts, who are the outstanding na-

tional leaders in their fields, have contributed to the making of this volume, which has been carefully organized into four parts: (I) Introductory; deals with the concept of the fullness of life and the contribution of physical education to full living. (II) The Status of the Individual; based on the questions, "What Should Be Known About an Individual, What Ought to Be Known About the Organic Status, the Neuro-Muscular Status, the Interpretive Status, the Emotional and Impulsive Status, and the Personality of an Individual?"

In this section the contribution, "What Should Be Known About an Individual," is a comprehensive and concise discussion of the status of the individual in all the phases. It is a noteworthy contribution for both administrators and students of physical education; (III) "What is the Nature and Scope of the Health Examinations Which the Physical Educator Can Make," is particularly significant, dealing as it does with such conditions and borderline diseases as the physical educator can and must be able to recognize. Each phase of this section has been handled by a specialist in his own field; (IV) "The Administration of Examinations," deals with the "Relationship of the Physical Director to Other Examining Experts," "The Training in Physical Education Necessary to Perform Examinations," "Problems Involved in Administration of Examinations from the Standpoint of the State," and "Problems Involved in the Administration from the Standpoint of City and County School Systems."

This volume is of inestimable value to every physical educator. It is a scholarly, scientific work so presented that it is a challenge to the intellectually alert educator. It should help administrators to determine individual needs and to establish an educational procedure to meet these needs. It is an admirable contribution to the field of physical education.

Ruth E. Campbell,
Physical Education Department,
University of Wyoming.

TAP, CAPER AND CLOG. By Helen Frost. A. S. Barnes & Co. 72 pp. $2.00.

The author, Miss Helen Frost, of Columbia University, is a pioneer in the field of teaching clog and character dances and is already well-known to the profession through her three previous books, *The Clog Dance Book, Clog and Character Dances* and *Oriental and Character Dances.* In *Tap, Caper and Clog* she makes a valuable addition to her already notable contribution.

Miss Frost starts with the purpose of creating character routine interesting enough to obviate the tendency to use jazz as the accompaniment to clogging. She believes that the enjoyment derived from beating out the accents of syncopated jazz rhythm is not sufficient justification for its use in the physical education program of our schools. I believe that jazz, properly used, can achieve real educational value in teaching rhythm and coordination. Since it plays so important a role in American recreation it seems to me not only a privilege but a duty of the teacher of physical education to include these familiar popular rhythms in the dance activity program, teaching them in a manner to endow them with maximum educational value. Nevertheless it is true that jazz cannot be made the exclusive nor perhaps even the principal motive in the dance pattern to be taught. What to use to vary or replace it is a problem that Miss Frost's book will help to solve.

The trouble with the large majority of character dances that have been available up to the present time has been that they have lacked the very element that was supposed to distinguish them—character. They have been monotonous because of repetition or vague about what they tried to express. Usually the character was expressed by the costumes and the music and the dance itself "got by" on their merit. It is not that it wasn't a good clog in itself, but usually it had nothing that marked it as the unique expression of a mood or an idea.

This criticism cannot be made of any of Miss Frost's new dances. The music, arranged by Ruth Garland and T. Frangopoulo, is so admirably suited to the dance patterns that one has no inclination to use the one without the other. The movements and accents of each dance express very vividly and satisfactorily the character it portrays and the music, as is proper, is incidental but so perfectly suited to the mood that it becomes the indispensable accompaniment.

Those who have used Miss Frost's other books will be glad to find in this one a list of all her dances classified according to difficulty. Other valuable features are the inclusion of a number of dances for boys, lucid explanations and practice rhythms for fundamental steps and variations. The book is attractively and profusely illustrated with photographic silhouettes.

Augusta M. Harris,
Michigan State Normal College,
Ypsilanti, Michigan.

BOOKS AND REPRINTS

of the American Physical Education Association

Address Box 362, Ann Arbor, Mich.

The recently published study "Physical Education Curriculum in Professional Schools" by the Committee on the Curriculum of the 139 institutions preparing teachers of Physical Education in the United States is available at the regular prices, i.e., $3.00 per copy.

The "Review," back copies to 1898: Single copies, 30c; 4 copies, $1.00; 10 or more, per copy, 20c. One volume, bound, $4.00 (Postage prepaid).

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